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1981 VOLUNTEER LAKE

MONITORING PROGRAM REPORT

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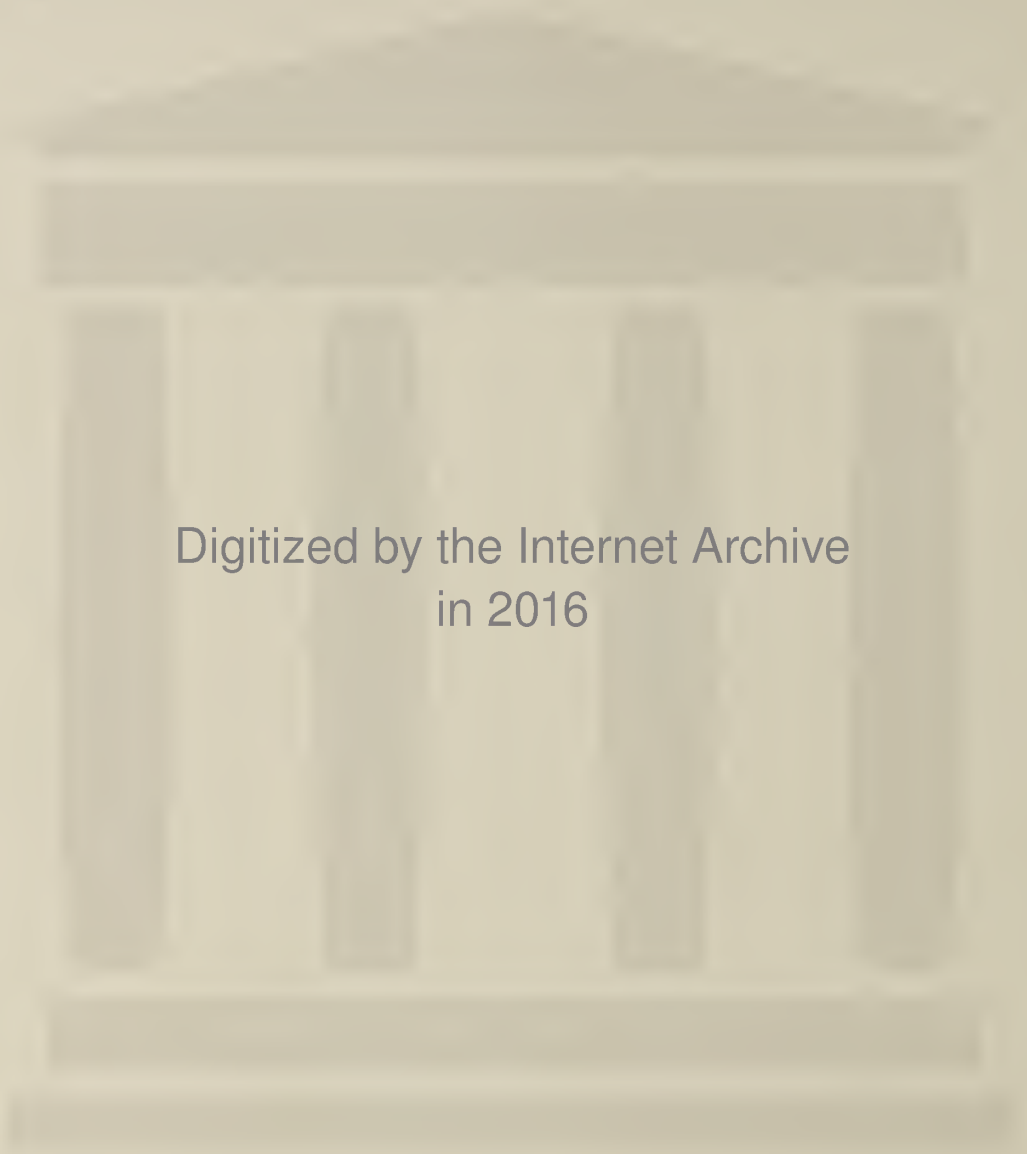

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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

FOR

OLD GILLESPIE LAKE, MACOUPIN COUNTY, ILLINOIS

A Cooperative Citizen-
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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ACKNOWLEDGEMENTS

This is one of 87 reports prepared for lakes in the 1981 Volunteer Lake Monitoring Program. It represents the coordinated effort of many individuals.

Illinois EPA's Ambient Monitoring Unit, Planning Section, Division of Water Pollution Control, under the direction of Kenneth R. Rogers, was responsible for the design and implementation of the program, as well as preparation of this report. Substantial assistance was provided by the Agency's Public Participation Section supervised by Gloria Craven.

Program coordination was provided by Donna Sefton for the Illinois EPA's Ambient Monitoring Unit and Carol Beim for the Public Participation Section.

Volunteers were trained by Public Participation Coordinators Carol Beim, Bob Hagele, William Hammel, Patrick McCarthy, Vanessa Musgrave, and Dawn Wrobel. Lake maps were prepared by J. W. Hammel and Bob Hagele. Lake assessment summaries were prepared by Patrick McCarthy.

Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

Donna Sefton, Howard Essig, John Little, John Lesnak, Carol Beim, and Bob Hagele wrote portions of the lake reports. Reports were edited by Planning Section and Public Participation staff, particularly Marilyn Budd and Mary Anderson. The contributions of Robert Clarke and Thomas Davenport are recognized.

Reports were typed by Word Processing under the direction of Norma Kraus and Diane Woodyard while Field Observations and Lake Assessment Summaries were typed by Betty Pennington, Lori Whalen, Karen Janssen, and Marilyn Budd.

INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Old Gillespie Lake is a 71 acre impoundment owned by the City of Gillespie, Macoupin County, Illinois. The lake, which was constructed by damming an unnamed creek in 1924, has a maximum depth of 19 feet, an average depth of 9.8 feet and a storage capacity of approximately 696 acre-feet (Table 1).

Old Gillespie Lake serves as a potable water supply for the City. The primary recreational use is fishing. Access is free and unlimited.

The 3,665 acre watershed of Old Gillespie Lake is estimated to be 40% cropland. The lake shoreline is also primarily row cropped. Suspended sediment and water level fluctuations are considered moderate problems. Pasture or grassland runoff and cropland runoff are cited as major pollution sources.

Assessment information on Old Gillespie Lake was provided by Raymond E. Fritz, the Water Treatment Operator, the Illinois State Water Survey, and the Illinois Department of Conservation. Monitoring was performed by Raymond Fritz. Secchi disc transparency, total depth, and field observations were recorded at three sites (located in Fig. 1) on the following dates: May 15 and 29, July 7, and August 5 and 17, 1981.

TABLE 1. LAKE ASSESSMENT SUMMARY, OLD GILLESPIE LAKE, MACOUPIN COUNTY, ILLINOIS (SD-A02-T)

I. GENERAL INFORMATION

River Basin: Illinois
Segment: A02

Ownership: City of Gillespie

Surface Area (Acres): 71
Watershed Area (Acres): 3665
Maximum Depth (Feet): 19
Average Depth (Feet): 9.8*
Storage Capacity (Acre/Feet): 696*
Inflowing Stream(s): Dry Fork at Macoupin Co.
Outflowing Stream(s): -
Water Retention Time: 0.253 years
Lake Type: Dammed stream
Year Constructed: 1924

II. USAGE

Public Access: yes
Lake Usage:
- Potable Water Supply: heavy
- Industrial Water Supply: none
- Agricultural Water Supply: none
- Cooling Water: none
- Recreation:
  - Fishing: moderate
  - Swimming: light
  - Power Boating: light
  - Row Boating or Canoeing: light
  - Sailboating: light
  - Camping: light
  - Picnicking: light
  - Waterfowl Hunting: light
  - Waterfowl Observation: light
  - Other:

Recreational Facilities:
beach

Shoreline Usage (Percent):
- Urban (Including Streets):
- Residential (Including Lawns):
- Golf Courses:
- Pasture or Grassland: 20% **
- Woodland: 30% **
- Row Crops: 50% **
- Wetland:
- Other:

Watershed Usage (Percent):
- Urban:
- Residential: 10%**
- Golf Courses:
- Pasture or Grassland: 20%**
- Woodland: 10**
- Row Crops: 40%**
- Wetland: 20%**
- Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: good
Fishing: good
Conditions and Extent:
- Suspended Sediment: moderate
- Deposition of Sediment:
- Algal Blooms: minimal
- Aquatic Weeds: minimal
- Taste and/or Odor: minimal
- Water Level Fluctuation: moderate
- Fishkills: minimal
- Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:
- Sewage Treatment Plant Effluent:
- Industrial Discharge:
- Urban Storm Drainage:
- Septic Tanks:
- Pasture or Grassland Runoff: yes
- Cropland Runoff: yes
- Feedlot Runoff:
- Construction Site Runoff:
- Fertilizer or Pesticides from Lawns/Golf Courses:
- Orchards:
- Forestry Operations Runoff:
- Mining:
- Waterfowl:
- Sediment in Lake:
- Other:

V. LAKE MANAGEMENT

Comments:

Information Supplied By Raymond Fritz (1981) *Illinois State Water Survey (1954); **Illinois Dept. of Conservation (1977)

FIGURE 1

OLD GILLESPIE LAKE

MACOUPIN COUNTY

RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Old Gillespie Lake are summarized in Table 2 and plotted in Fig. 2. Total depth data are provided in Table 3, while field observation are summarized in Table 4.

Transparency of Old Gillespie Lake

The average Secchi disc transparency of Old Gillespie Lake was 46.8 inches, which ranked number 26 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was slightly less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976). However, it was in the normal range for Illinois lakes and was compatible with most recreational uses.

Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Old Gillespie Lake ranged from a maximum of 72 inches at Sites 2 and 3 on August 17 to a minimum of 30 inches at Site 2 on May 29.

Clarity was relatively uniform at the three sites. Transparency averaged 48.0 inches, 46.8 inches and 45.6 inches at Sites 1, 2 and 3, respectively. Secchi readings were less than the four feet minimum recommended for swimming on two of the five sampling dates at Site 1 (May 15 and 24) and on three of the five dates at Sites 2 and 3 (May 15 and 29 and July 7).

There were seasonal differences in the transparency of Old Gillespie Lake. Lowest transparencies were generally recorded in midspring to early summer, and were probably the result of algal blooms. Field observations of water color and amount of algae indicate that the transparency of Old Gillespie Lake is influenced primarily by the presence of algae. A very green water color was observed throughout most of the sampling, while a moderate green color was noted on the date with the highest transparencies. Copper sulfate was applied on May 8 for the control of algae. Aquatic weeds were noted as abundant along the shoreline of all sites as well as at Site 3. This is probably related to the shallow-nature of the Site 3 (average depth 9.2 feet) and/or nutrient input in the vicinity.

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) GILLESPIE OLD/MACOUPIN COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 15	36.0	36.0	36.0	36.0	0.0
05/ 29	36.0	30.0	36.0	34.0	3.5
07/ 7	60.0	36.0	36.0	44.0	13.9
08/ 5	48.0	60.0	48.0	52.0	6.9
08/ 17	60.0	72.0	72.0	68.0	6.9

SUMMARY STATISTICS

	SITES			LAKE
MEAN	48.0	46.8	45.6	46.8
STD DEV	12.0	18.2	15.6	14.4
MIN	36.0	30.0	36.0	30.0
MAX	60.0	72.0	72.0	72.0
AV DEPTH	18.6	12.2	9.2	

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) GILLESPIE OLD/MACOUPIN COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 15	19.0	13.0	10.0	14.0	4.6
05/ 29	19.0	12.0	9.0	13.3	5.1
07/ 7	19.0	12.0	9.0	13.3	5.1
08/ 5	19.0	12.0	9.0	13.3	5.1
08/ 17	17.0	12.0	9.0	12.7	4.0

SUMMARY STATISTICS

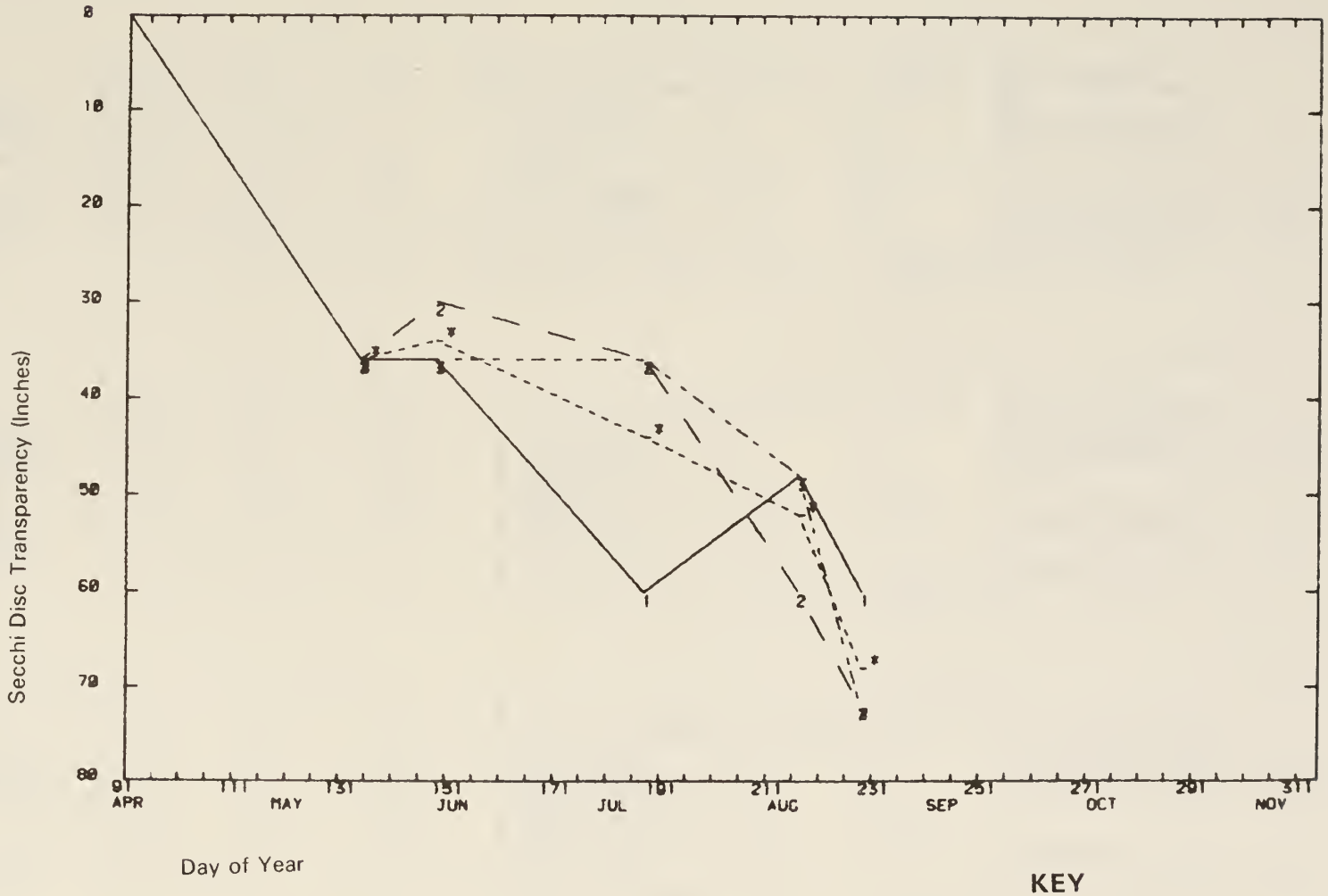
	SITES			LAKE
MEAN	18.6	12.2	9.2	13.3
STD DEV	0.9	0.4	0.4	4.1
MIN	17.0	12.0	9.0	9.0
MAX	19.0	13.0	10.0	19.0
AV DEPTH	18.6	12.2	9.2	

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) GILLESPIE OLD/MACOUPIN COUNTY, ILLINOIS (VOLUNTEER DATA 1981)



KEY

1 Site 1
2 Site 2
3 Site 3
* Mean (Average)

TABLE 4. FIELD OBSERVATIONS, GILLESPIE OLD LAKE. MACOUPIN COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
5/15/81	WATER COLOR:	very green	very green	very green
	SEDIMENT:	slight	slight	slight
	ALGAE:	minimal	minimal	slight
	WEEDS AT SAMPLE SITE:	minimal	minimal	large
	WEEDS NEAR SHORE:	large	large	large
	OTHER SUBSTANCES:	none	none	lily pads
	ODOR:	no odor	no odor	fishy

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	many clouds
PRECIPITATION:	no rain	mod. rain
WAVES:	ripple	moderate
AIR TEMPERATURE:	cool	cool
WIND DIRECTION:	SW	S

OBSERVATIONS MADE BY: Raymond E. Fritz

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: fishing

LAKE MANAGEMENT: 5/8/81 copper sulfate treatment. 700# used
ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
5/29/81	WATER COLOR:	very green	very green	very green
	SEDIMENT:	slight	slight	slight
	ALGAE:	slight	slight	moderate
	WEEDS AT SAMPLE SITE:	slight	slight	large
	WEEDS NEAR SHORE:	slight	slight	large
	OTHER SUBSTANCES:	"clippings"	none	lily pads
	ODOR:	musty	fishy	musty

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	many clouds
PRECIPITATION:	no rain	heavy rain
WAVES:	ripple	ripple
AIR TEMPERATURE:	hot	warm
WIND DIRECTION:	SSW	SSW

OBSERVATIONS MADE BY: Raymond E. Fritz

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: fishing, swimming, camping, picnicking

LAKE MANAGEMENT: 5/8/81 copper sulfate treatment for algae control
ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
7/7/81	WATER COLOR:	very green	very green	very green
	SEDIMENT:	minimal	minimal	minimal
	ALGAE:	moderate	moderate	large
	WEEDS AT SAMPLE SITE:	minimal	slight	large
	WEEDS NEAR SHORE:	slight	slight	large
	OTHER SUBSTANCES:	"clippings"	duckweed	lily pads
	ODOR:	musty	musty	fishy

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	hazy	hazy
PRECIPITATION:	no rain	heavy rain
WAVES:	ripple	white caps
AIR TEMPERATURE:	hot	warm
WIND DIRECTION:	S	SW

OBSERVATIONS MADE BY: Raymond E. Fritz

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: fishing, swimming, power boating, camping, picnicking

LAKE MANAGEMENT: none

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
8/5/81	WATER COLOR;	very green	very green	very green
	SEDIMENT:	moderate	moderate	moderate
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	moderate
	WEEDS NEAR SHORE:	large	large	large
	OTHER SUBSTANCES:	dead fish	oil films	duckweed
	ODOR:	fishy	fishy	fishy

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	clear
PRECIPITATION:	heavy rain	no rain
WAVES:	ripple	calm
AIR TEMPERATURE:	warm	hot
WIND DIRECTION:	S	SW

OBSERVATIONS MADE BY: Raymond E. Fritz

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: fishing, swimming, camping, picnicking

LAKE MANAGEMENT: none

ADDITIONAL COMMENTS:

TABLE 4. FIELD OBSERVATIONS, GILLESPIE OLD LAKE, MACOUPIN COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/17/81	WATER COLOR:	mod. green	mod. green	pea soup	CLOUD COVER:	clear	many clouds	WATER LEVEL OF LAKE: below normal 4"
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: fishing, swimming, camping
	ALGAE:	slight	slight	large	WAVES:	small	moderate	
	WEEDS AT SAMPLE SITE:	minimal	slight	moderate	AIR TEMPERATURE:	warm	cool	
	WEEDS NEAR SHORE:	minimal	large	large	WIND DIRECTION:	N	S	LAKE MANAGEMENT: none
	OTHER SUBSTANCES:	waterfowl	duckweed	duckweed				
	ODOR:	no odor	no odor	fishy	OBSERVATIONS MADE BY:	Raymond E. Fritz		ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR:				CLOUD COVER:			WATER LEVEL OF LAKE:
	SEDIMENT:				PRECIPITATION:			RECREATIONAL USAGE:
	ALGAE:				WAVES:			
	WEEDS AT SAMPLE SITE:				AIR TEMPERATURE:			
	WEEDS NEAR SHORE:				WIND DIRECTION:			LAKE MANAGEMENT:
	OTHER SUBSTANCES:							
	ODOR:				OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR:				CLOUD COVER:			WATER LEVEL OF LAKE:
	SEDIMENT:				PRECIPITATION:			RECREATIONAL USAGE:
	ALGAE:				WAVES:			
	WEEDS AT SAMPLE SITE:				AIR TEMPERATURE:			
	WEEDS NEAR SHORE:				WIND DIRECTION:			LAKE MANAGEMENT:
	OTHER SUBSTANCES:							
	ODOR:				OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR;				CLOUD COVER:			WATER LEVEL OF LAKE:
	SEDIMENT:				PRECIPITATION:			RECREATIONAL USAGE:
	ALGAE:				WAVES:			
	WEEDS AT SAMPLE SITE:				AIR TEMPERATURE:			
	WEEDS NEAR SHORE:				WIND DIRECTION:			LAKE MANAGEMENT:
	OTHER SUBSTANCES:							
	ODOR:				OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Old Gillespie Lake (estimated at twice the Secchi depth) ranged from 6.0 - 10.0 feet at Site 1, 5.0 - 12.0 feet at Site 2, and 6.0 - 12.0 feet at Site 3. Since Sites 1 and 2 were deep enough to thermally stratify and had a euphotic zone that was generally less than the total depth, low dissolved oxygen values would be expected in the bottom waters of these sites during summer stratification.

In the absence of dissolved oxygen, substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. These substances can contribute to serious taste and odor problems in drinking water if water supply is taken from near the lake bottom during summer stratification. When these substances are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, and other water quality problems.

SUMMARY AND RECOMMENDATIONS

Summary

Old Gillespie Lake, a public water supply impoundment in central Illinois, was sampled on five dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer Raymond Fritz recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Old Gillespie Lake (46.8 inches) ranked 26th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). Although this average transparency was slightly less than the four feet minimum recommended for swimming by the Department of Public Health, it was in normal range for Illinois lakes. Field observations indicated that the transparency of Old Gillespie Lake was influenced primarily by the presence of algae.

Old Gillespie Lake is deep enough to thermally stratify during the summer. Since the lower limit of its euphotic zone (estimated at twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Old Gillespie Lake is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae and sediment problems. Protection from further degradation is critical. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient contributions from septic tanks, fertilization of lawns, and waterfowl should also be investigated and minimized.

In-lake management may also warrant consideration. Drawing oxygenated water from the upper strata for water supply use may help alleviate taste and odor problems. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem causing blue-greens, reduce the need for copper sulfate, help to alleviate taste and odor problems, and improve fishing.

Continued monitoring is recommended for Old Gillespie Lake. Consistent data gathered over a period of years is necessary to document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

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DS:jab/sp2161c

GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratifcation - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic setteable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen dificiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and exhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution eminating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy priviledges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

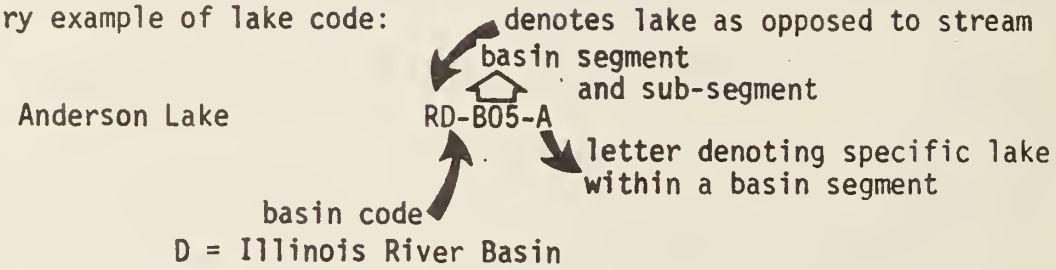
water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

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Lake Oakland | Coles Co.

1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

FOR

LAKE OAKLAND, COLES COUNTY, ILLINOIS

A Cooperative Citizen-
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Lake Oakland is a 26 acre impoundment owned by the City of Oakland, Coles County, Illinois. The lake, which was constructed by damming Hogue Branch in 1937, has a maximum depth of 9.5 feet, an average depth of 5.1 feet and a storage capacity of 133.6 acre-feet (Table 1).

Lake Oakland serves as a potable water supply for the City. Recreational uses associated with the lake include fishing, boating, picnicking, and waterfowl hunting and observation. Access is free and unlimited.

The 9,158 acre watershed of Lake Oakland is estimated to be 85% row crops. The lake shoreline is estimated at 50% residential and 50% woodland.

Deposition of sediment is considered a substantial problem for the lake, while suspended sediment and taste and odor are considered moderate problems. Septic tanks, pasture and grassland runoff, cropland runoff, feedlot runoff and sediment in the lake are cited as potential pollution sources.

TABLE 1. LAKE ASSESSMENT SUMMARY, LAKE OAKLAND, COLES COUNTY, ILLINOIS (RB-A05-P).

I. GENERAL INFORMATION

River Basin: Wabash
Segment: A05

Ownership: City of Oakland

Surface Area (Acres): 26
Watershed Area (Acres): 9158
Maximum Depth (Feet): 9.5
Average Depth (Feet): 5.14
Storage Capacity (Acre/Feet): 133.6
Inflowing Stream(s): Hoque Branch
Outflowing Stream(s): Hoque Branch
Water Retention Time: 0.017 years
Lake Type: dammed stream
Year Constructed: 1937

II. USAGE

Public Access: yes
Lake Usage:
- Potable Water Supply: very heavy
- Industrial Water Supply: none
- Agricultural Water Supply: light
- Cooling Water: none
- Recreation: moderate
  - Fishing: moderate
  - Swimming: none
  - Power Boating: light
  - Row Boating or Canoeing: light
  - Sailboating: light
  - Camping: none
  - Picnicking: light
  - Waterfowl Hunting: light
  - Waterfowl Observation: light
  - Other:

Recreational Facilities:
picnic areas, boat launch

Shoreline Usage (Percent):
- Urban (Including Streets):
- Residential (Including Lawns): 50%
- Golf Courses:
- Pasture or Grassland:
- Woodland: 50%
- Row Crops:
- Wetland:
- Other:

Watershed Usage (Percent):
- Urban: 5%
- Residential:
- Golf Courses:
- Pasture or Grassland: 5%
- Woodland: 5%
- Row Crops: 85%
- Wetland:
- Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: fair
Fishing: fair
Conditions and Extent:
- Suspended Sediment: moderate
- Deposition of Sediment: large
- Algal Blooms: slight
- Aquatic Weeds: slight
- Taste and/or Odor: moderate
- Water Level Fluctuation: slight
- Fishkills: minimal
- Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:
- Sewage Treatment Plant Effluent:
- Industrial Discharge:
- Urban Storm Drainage:
- Septic Tanks: yes
- Pasture or Grassland Runoff: yes
- Cropland Runoff: yes
- Feedlot Runoff: yes
- Construction Site Runoff:
- Fertilizer or Pesticides from Lawns/Golf Courses:
- Orchards:
- Forestry Operations Runoff:
- Mining:
- Waterfowl:
- Sediment in Lake: yes
- Other:

V. LAKE MANAGEMENT

Comments: Spray copper sulfate yearly to control algae. Mud cat dredging in 1973, 74, 75.

Information Supplied By Oakland Water Department (1981)

Assessment information on Lake Oakland was provided by Dale Hanner, the Water Treatment Plant Operator. Monitoring was performed by Dale Hanner, Randy Duzan, Bill Hammel, and Ken McClain. Secchi disc transparency, total depth, and field observations were recorded at three sites (located in Fig. 1) on the following dates: May 5 and 21, June 4 and 19, July 3 and 23, August 11 and 28, September 10 and 24 and October 8 and 30, 1981.

RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Lake Oakland are summarized in Table 2 and plotted in Fig. 2. Total depth data are provided in Table 3, while Field Observations are summarized in Table 4.

Transparency of Lake Oakland

The average Secchi disc transparency of Lake Oakland was 13.6 inches, which ranked number 74 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was in the range generally associated with with use impairment problems in Illinois lakes. Above average rainfall during the sampling season may have resulted in lower than normal transparency.

Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Lake Oakland ranged from a minimum of 6 inches at Sites 1 and 3 on May 21 to a maximum of 24 inches at Site 1 on June 19.

Clarity at the three sites was relatively uniform. Transparency averaged 13.7 inches, 14.8 inches and 12.2 inches at Sites 1, 2, and 3, respectively. Readings at all three sites were less than than the four feet minimum recommended for swimming on all sampling dates. The low Secchi readings were probably related, in part, to the shallow depths of the sites (average depths were 11.7 feet, 5.3 feet and 2.7 feet for sites 1, 2 and 3, respectively), which allowed resuspension of bottom sediments by wind and wave activity. The fact that the transparency did not significantly increase from the lake headwaters to the dam, as is

FIGURE 1

LAKE OAKLAND

COLES COUNTY

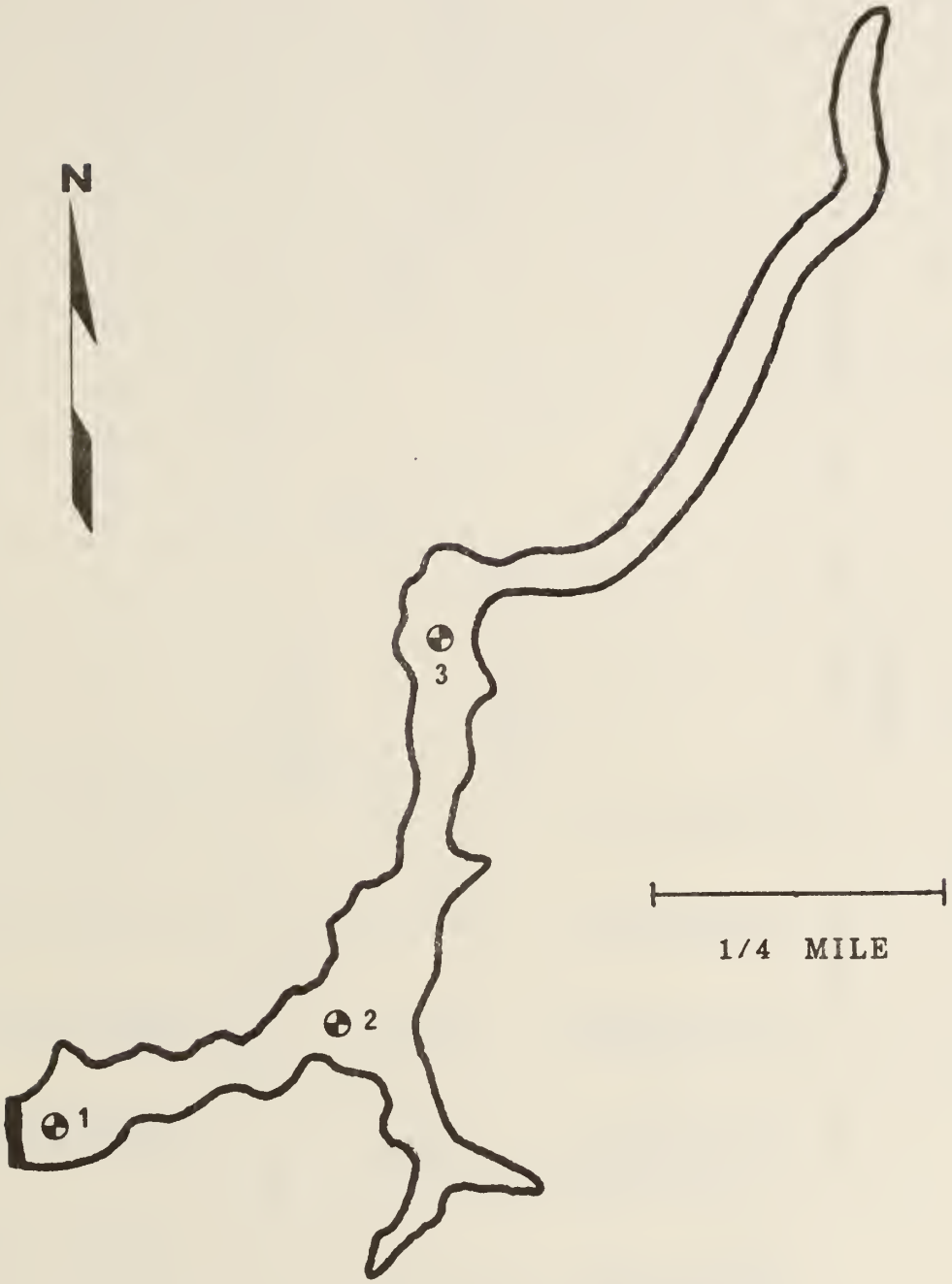

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) OAKLAND/COLES COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 5	14.0	14.0	12.0	13.3	1.2
05/ 21	6.0	10.0	6.0	7.3	2.3
06/ 4	20.0	20.0	14.0	18.0	3.5
06/ 19	24.0	18.0	18.0	20.0	3.5
07/ 3	8.0	12.0	8.0	9.3	2.3
07/ 23	16.0	16.0	16.0	16.0	0.0
08/ 11	10.0	14.0	10.0	11.3	2.3
08/ 20	12.0	10.0	10.0	10.7	1.2
09/ 10	12.0	18.0	16.0	15.3	3.1
09/ 24	14.0	16.0	12.0	14.0	2.0
10/ 8	10.0	12.0	12.0	11.3	1.2
10/ 30	18.0	18.0	12.0	16.0	3.5

SUMMARY STATISTICS

	SITES			LAKE
MEAN	13.7	14.0	12.2	13.6
STD DEV	5.2	3.4	3.5	4.1
MIN	6.0	10.0	6.0	6.0
MAX	24.0	20.0	18.0	24.0
AV DEPTH	11.7	5.3	2.7	

-1 = missing value

TABLE 3

See glossary for explanation of Summary Statistics.

DEPTH OF SITE (FEET) OAKLAND/COLES COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 5	9.0	5.0	2.0	5.3	3.5
05/ 21	13.0	6.0	3.0	7.3	5.1
06/ 4	13.0	4.5	2.5	6.7	5.6
06/ 19	13.0	5.0	2.0	6.7	5.7
07/ 3	12.0	5.0	2.0	6.3	5.1
07/ 23	8.5	5.0	3.0	5.5	2.8
08/ 11	11.0	5.0	3.0	6.3	4.2
08/ 20	11.5	5.5	3.0	6.7	4.4
09/ 10	12.0	6.0	3.0	7.0	4.6
09/ 24	12.5	5.0	3.0	6.8	5.0
10/ 8	13.0	6.0	3.0	7.3	5.1
10/ 30	11.5	5.0	3.0	6.5	4.4

SUMMARY STATISTICS

	SITES			LAKE
MEAN	11.7	5.3	2.7	6.5
STD DEV	1.5	0.5	0.5	3.0
MIN	8.5	4.5	2.0	2.0
MAX	13.0	6.0	3.0	13.0
AV DEPTH	11.7	5.3	2.7	

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) OAKLAND/COLES COUNTY, ILLINOIS (VOLUNTEER DATA 1991)

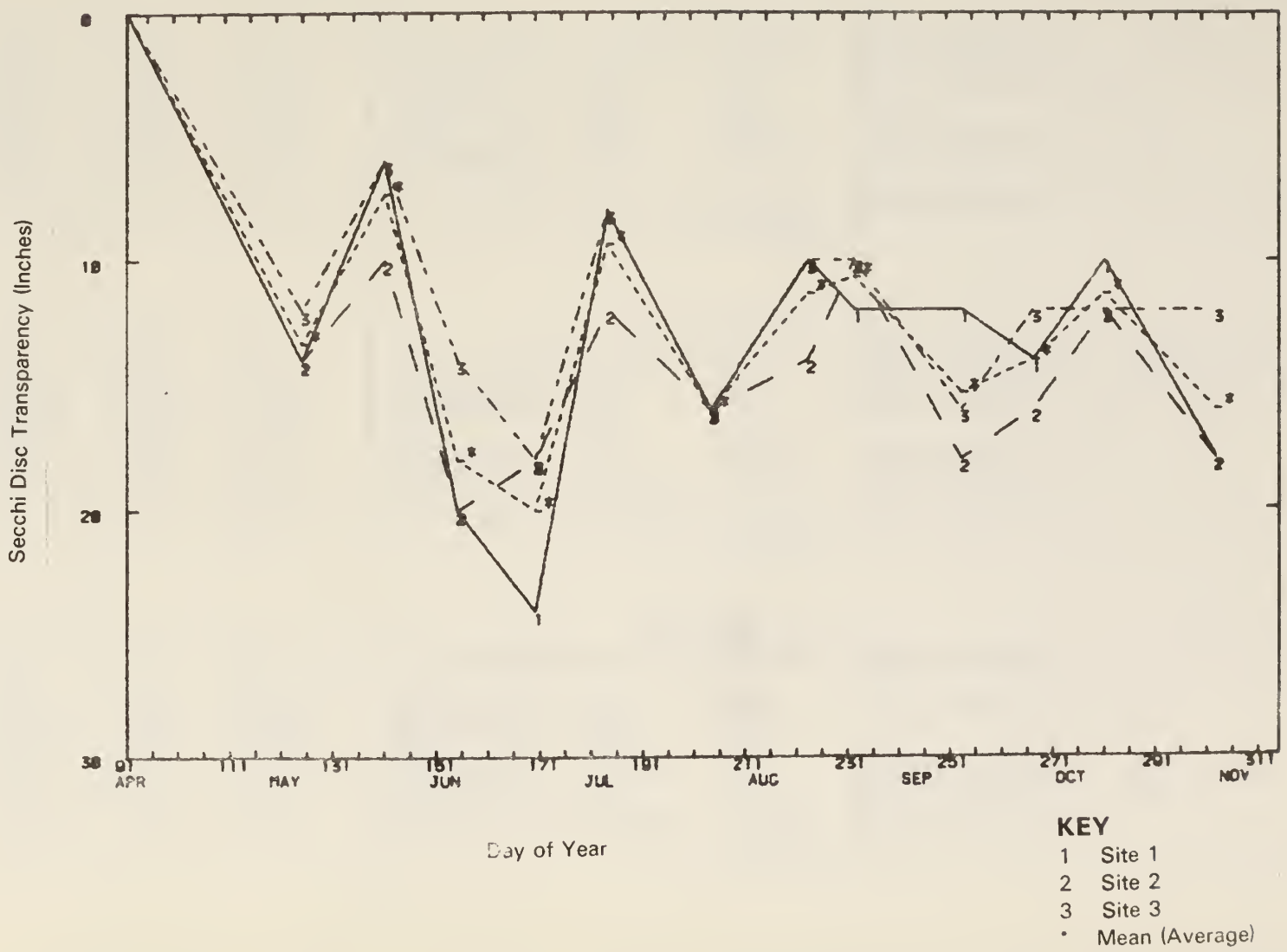

TABLE 4. FIELD OBSERVATIONS, LAKE OAKLAND, COLES COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
5/5/81	WATER COLOR:	mod. brown	mod. brown	mod. brown
	SEDIMENT:	slight	slight	slight
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	slight
	OTHER SUBSTANCES:	none	none	waterfowl
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	overcast	clear
PRECIPITATION:	lt. rain	no rain
WAVES:	calm	calm
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	SW	SW

OBSERVATIONS MADE BY: Dale Hanner, Randy Duzan, Bill Hammel

OTHER COMMENTS

WATER LEVEL OF LAKE: above normal 2"
RECREATIONAL USAGE: none

LAKE MANAGEMENT: none

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
5/21/81	WATER COLOR:	very brown	very brown	very brown
	SEDIMENT:	large	large	large
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	slight
	OTHER SUBSTANCES:	none	none	none
	ODOR:	musty	musty	musty

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	clear
PRECIPITATION:	no rain	no rain
WAVES:	calm	calm
AIR TEMPERATURE:	warm	cool
WIND DIRECTION:	NE	NE

OBSERVATIONS MADE BY: Dale Hanner, Randy Duzan

OTHER COMMENTS

WATER LEVEL OF LAKE: above normal 6"
RECREATIONAL USAGE: none

LAKE MANAGEMENT: 5/18-19 Sludge gates open to lower lake from high amt. of rain
ADDITIONAL COMMENTS: High water

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
6/4/81	WATER COLOR:	mod. brown	mod. brown	mod. brown
	SEDIMENT:	slight	slight	slight
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	slight
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	clear
PRECIPITATION:	no rain	no rain
WAVES:	calm	ripple
AIR TEMPERATURE:	hot	hot
WIND DIRECTION:	SW	SW

OBSERVATIONS MADE BY: Dale Hanner, Ken McClain

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: fishing

LAKE MANAGEMENT: 6/3/81 copper sulfate entire lake 100# for algae control
ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
6/19/81	WATER COLOR;	grn-brn	grn-brn	grn-brn
	SEDIMENT:	minimal	minimal	minimal
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	slight
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	overcast	clear
PRECIPITATION:	no rain	no rain
WAVES:	calm	calm
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	S	S

OBSERVATIONS MADE BY: Dale Hanner, Randy Duzan

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: fishing

LAKE MANAGEMENT: none

ADDITIONAL COMMENTS:

TABLE 4. FIELD OBSERVATIONS, LAKE OAKLAND, COLES COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS	
7/3/81	WATER COLOR:	mod. brown	mod. brown	mod. brown	CLOUD COVER:	few clouds	clear	WATER LEVEL OF LAKE:	normal
	SEDIMENT:	slight	slight	slight	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE:	fishing
	ALGAE:	minimal	minimal	minimal	WAVES:	calm	calm		
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	hot	hot		
	WEEDS NEAR SHORE:	minimal	minimal	moderate	WIND DIRECTION:	SE	NE	LAKE MANAGEMENT:	none
	OTHER SUBSTANCES:	none	none	none					
					OBSERVATIONS MADE BY:	Dale Hanner		ADDITIONAL COMMENTS:	
	ODOR:	no odor	no odor	no odor		Kenny McClain			

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS	
7/23/81	WATER COLOR:	lt. brown	lt. brown	lt. brown	CLOUD COVER:	few clouds	clear	WATER LEVEL OF LAKE:	normal
	SEDIMENT:	slight	slight	slight	PRECIPITATION:	no rain	v. lt. rain	RECREATIONAL USAGE:	none
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	ripple		
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	warm		
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	S	SE	LAKE MANAGEMENT:	none
	OTHER SUBSTANCES:	"clippings"	none	none					
					OBSERVATIONS MADE BY:	Randy Duzan		ADDITIONAL COMMENTS:	
	ODOR:	no odor	no odor	no odor		Kenny McClain			

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS	
8/11/81	WATER COLOR:	mod. brown	mod. brown	very brown	CLOUD COVER:	hazy	overcast	WATER LEVEL OF LAKE:	normal
	SEDIMENT:	moderate	moderate	moderate	PRECIPITATION:	no rain	v. lt. rain	RECREATIONAL USAGE:	none
	ALGAE:	minimal	minimal	slight	WAVES:	calm	ripple		
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	warm		
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	S	NW	LAKE MANAGEMENT:	none
	OTHER SUBSTANCES:	none	none	refuse oil films					
					OBSERVATIONS MADE BY:	Randy Duzan		ADDITIONAL COMMENTS:	
	ODOR:	musty	musty	musty		Kenny McClain			

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS	
8/20/81	WATER COLOR:	mod. brown	mod. brown	mod. brown	CLOUD COVER:	clear	clear	WATER LEVEL OF LAKE:	normal
	SEDIMENT:	moderate	moderate	moderate	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE:	none
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	calm		
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	warm		
	WEEDS NEAR SHORE:	minimal	minimal	slight	WIND DIRECTION:	NE	NE	LAKE MANAGEMENT:	none
	OTHER SUBSTANCES:	none	none	none					
					OBSERVATIONS MADE BY:	Randy Duzan		ADDITIONAL COMMENTS:	
	ODOR:	no odor	no odor	no odor		Kenny McClain			

TABLE 4. FIELD OBSERVATIONS, LAKE OAKLAND, COLES COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
9/10/81	WATER COLOR:	grn-brn	grn-brn	grnsh-brn
	SEDIMENT:	minimal	minimal	minimal
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	slight
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	clear
PRECIPITATION:	no rain	no rain
WAVES:	ripple	calm
AIR TEMPERATURE:	hot	warm
WIND DIRECTION:	S	SW
OBSERVATIONS MADE BY:	Randy Duzan	

OTHER COMMENTS

WATER LEVEL OF LAKE: above normal 2"
RECREATIONAL USAGE: none

LAKE MANAGEMENT: 8/27/81
Sprayed 100# of copper sulfate for algae
ADDITIONAL COMMENTS: Late August early Sept. heavy rains. Lake was high & flood gates open for three days.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
9/24/81	WATER COLOR:	mod. brown	mod. brown	lt. brown
	SEDIMENT:	slight	slight	slight
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	slight
	OTHER SUBSTANCES:	none	none	waterfowl
	ODOR:	fishy	fishy	fishy

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	clear
PRECIPITATION:	no rain	no rain
WAVES:	calm	ripple
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	S	NW
OBSERVATIONS MADE BY:	Randy Duzan Kenny McClain	

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: none

LAKE MANAGEMENT: none

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
10/8/81	WATER COLOR:	mod. green	mod. green	mod. green
	SEDIMENT:	slight	slight	slight
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	minimal
	OTHER SUBSTANCES:	leaves	none	waterfowl
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	clear
PRECIPITATION:	no rain	no rain
WAVES:	ripple	ripple
AIR TEMPERATURE:	cool	cool
WIND DIRECTION:	N	NW
OBSERVATIONS MADE BY:	Randy Duzan Kenny McClain	

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: none

LAKE MANAGEMENT: none

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
10/30/81	WATER COLOR:	lt. brown	lt. brown	lt. brown
	SEDIMENT:	minimal	minimal	slight
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	slight
	OTHER SUBSTANCES:	none	none	leaves
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	clear
PRECIPITATION:	no rain	no rain
WAVES:	ripple	ripple
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	S.E.	S.
OBSERVATIONS MADE BY:	Randy Duzan & Kenny McClain	

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: fishing

LAKE MANAGEMENT: none

ADDITIONAL COMMENTS:

typical of Illinois reservoirs, may be attributed in part to the very short water retention time of 0.017 years (6.2 days). This short water retention time would probably not allow the suspended sediment load to settle out in the upper end of the lake so that the water would become clearer towards the dam.

Field observations of brown water color indicate that the lack of transparency in Lake Oakland was primarily due to sediment. Very heavy rains in May caused the water to be very brown; it was usually light or moderately brown at other times. Green-brown water colors were noted on June 19 and September 10, while the water was moderately green on October 8. Copper sulfate was utilized for algal control in June and August; thus algae were considered a problem at those times.

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Lake Oakland (estimated at twice the Secchi depth) ranged from 1.0 - 4.0 feet at Site 1, 1.7 - 3.3 feet at Site 2, and 1.0 - 3.0 feet at Site 3. Since Sites 1 and 2 were deep enough to thermally stratify and had a euphotic zone that was generally less than the total depth, low dissolved oxygen values would be expected in the bottom waters of these sites during summer stratification.

In the absence of dissolved oxygen, substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. These substances can contribute to serious taste and odor problems in drinking water if water supply is taken from near the lake bottom during summer stratification. When these substances are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, and other water quality problems.

SUMMARY AND RECOMMENDATIONS

Summary

Lake Oakland, a small, shallow public water supply impoundment in east-central Illinois was sampled on 12 dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteers recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Lake Oakland (13.6 inches) ranked 74th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was less than the four feet minimum recommended for swimming by the Department of Public Health and was in the range generally associated with use impairment problems for Illinois lakes.

Field observations of brown water color indicate that the transparency of Lake Oakland was primarily influenced by sediment, although on certain dated a green-brown water color indicated the presence of algae.

Site 1 on Lake Oakland is deep enough to thermally stratify during the summer. Since the lower limit of its euphotic zone (estimated at twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Lake Oakland is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae and sediment problems. Protection from further degradation is critical. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Pollutant contributions from urban storm drainage and fertilization of lawns should also be investigated and minimized.

In-lake management may also warrant consideration. Drawing oxygenated water from the upper strata for water supply use may help alleviate taste and odor problems. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem causing blue-greens, alleviate taste and odor problems, and improve fishing.

Continued monitoring is recommended for Lake Oakland. Consistent data gathered over a period of years is necessary to document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

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GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratifcation - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic setteable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen dificiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and exhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution eminating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy priviledges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

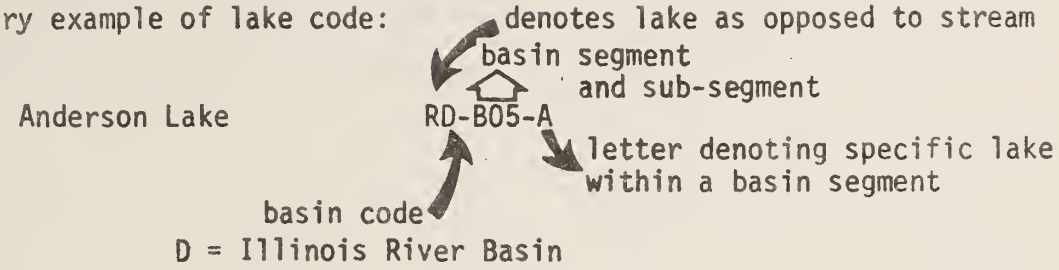
water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

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Northern Oaks Lake / Tazewell Co.

1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

FOR

NORTHERN OAKS LAKE, TAZEWELL COUNTY, ILLINOIS

A Cooperative Citizen-
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lake data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled, "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Northern Oaks Lake is a 38 acre impoundment located in Tazewell County, 1 mile west of Groveland, Illinois. It is owned by the Northern Oaks Homeowners Association. The lake, which was constructed by damming Upper Lick Creek in 1959, has a maximum depth of 52 feet, an average depth of 20 feet and a storage capacity of 760 acre-feet (Table 1).

Northern Oaks Lake serves as a potable water supply for the subdivision. Major recreational uses associated with the lake are fishing and swimming. Access is limited to organization members and their guests.

The 1,000 acre watershed of Northern Oaks Lake is estimated to be 75% row crops. The lake shoreline is primarily residential.

Suspended sediment, deposition of sediment and aquatic weeds are considered moderate problems for Northern Oaks Lake. Septic tanks, pasture, grassland and cropland runoff, fertilizer or pesticides from lawns and golf courses, waterfowl and sediment in the lake are cited as potential pollution sources.

Assessment and monitoring information on Northern Oaks Lake was provided by John H. Wald. Secchi disc transparency, total depth, and field observations were recorded at three sites (located in Fig. 1) on six dates in 1981: April 18, May 15 and 26, June 14, July 26 and August 2.

TABLE 1. LAKE ASSESSMENT SUMMARY, NORTHERN OAKS LAKE, TAZEWELL COUNTY, ILLINOIS (SD-B05-W).

I. GENERAL INFORMATION

River Basin: Illinois
Segment: B05

Ownership: Northern Oaks Homeowners Assn.

Surface Area (Acres): 38
Watershed Area (Acres): 1000
Maximum Depth (Feet): 52
Average Depth (Feet): 20
Storage Capacity (Acre/Feet): 760
Inflowing Stream(s): Upper Lick Creek
Outflowing Stream(s): Upper Lick Creek
Water Retention Time:
Lake Type: Dammed Stream
Year Constructed: 1959

II. USAGE

Public Access: No - Organization members and guests only.
Lake Usage:
Potable Water Supply: heavy
Industrial Water Supply: none
Agricultural Water Supply: none
Cooling Water: none
Recreation:
Fishing: moderate
Swimming: moderate
Power Boating: none
Row Boating or Canoeing: light
Sailboating: light
Camping: none
Picnicking: none
Waterfowl Hunting: none
Waterfowl Observation: light
Other:

Recreational Facilities:
Beach, boat launch.

Shoreline Usage (Percent):
Urban (Including Streets):
Residential (Including Lawns): 90%
Golf Courses:
Pasture or Grassland:
Woodland: 5%
Row Crops:
Wetland:
Other:

Watershed Usage (Percent):
Urban:
Residential: 20%
Golf Courses:
Pasture or Grassland:
Woodland: 5%
Row Crops: 75%
Wetland:
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: good
Fishing: excellent
Conditions and Extent:
Suspended Sediment: moderate
Deposition of Sediment: moderate
Algal Blooms:
Aquatic Weeds: moderate
Taste and/or Odor: slight
Water Level Fluctuation: slight
Fishkills: minimal
Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:
Sewage Treatment Plant Effluent:
Industrial Discharge:
Urban Storm Drainage:
Septic Tanks: yes
Pasture or Grassland Runoff: yes
Cropland Runoff: yes
Feedlot Runoff:
Construction Site Runoff:
Fertilizer or Pesticides from Lawns/Golf Courses: yes
Orchards:
Forestry Operations Runoff:
Mining:
Waterfowl: yes
Sediment in Lake: yes
Other:

V. LAKE MANAGEMENT

Comments: Yearly treated with copper sulfate to control algae.

Information Supplied By John H. Wald (1981)

FIGURE 1

NORTHERN OAKS LAKE

TAZEWELL COUNTY

RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report, "Volunteer Lake Monitoring, 1981", Section IV, "Understanding Illinois' Lakes".

The Secchi monitoring data for Northern Oaks Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are presented in Table 3, while field observations are summarized in Table 4.

Transparency of Northern Oaks Lake

The average Secchi disc transparency of Northern Oaks Lake was 41.2 inches, which ranked number 40 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976). However, it was in the normal range for Illinois lakes and was compatible with most recreational uses.

Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Northern Oaks Lake ranged from a minimum of 22 inches at Site 3 on May 15 to a maximum of 66 inches at Site 1 on May 26.

As is typical of Illinois reservoirs, a spatial trend of increasing transparency from the lake headwaters to the dam was apparent in Northern Oaks Lake. The average transparencies at Sites 3, 2 and 1 (headwaters to dam) were 33.7 inches, 41.0 inches and 49.0 inches respectively. Secchi readings were below the four feet minimum recommended for swimming on three of the six sampling dates at Sites 1 and 2 (April 15, June 14 and July 26) and on four of the six dates at Site 3 (April 18, May 15, June 14, and July 26).

Field observations indicate that the transparency of Northern Oaks Lake is influenced by both algae and suspended sediment at Site 3 and by primarily algae at Sites 1 and 2. The sediment load tends to settle out in the upper end of the lake so that the water becomes clearer towards the dam. Amounts of suspended sediment were usually observed to be greater at Site 3 than at Sites 1 and 2, and the water color generally changed from a brownish-green at Site 3 to green at Site 1. The lake is routinely treated with copper sulfate to control algal growth.

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) NORTHERN OAKS/TAZEWELL COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
04/ 18	60 0	48.0	30.0	46.0	15 1
05/ 15	36 0	24 0	22.0	27 3	7.6
05/ 26	66 0	54.0	48.0	56 0	9 2
06/ 14	36 0	30 0	24 0	30.0	6 0
07/ 26	42 0	36 0	30 0	36 0	6 0
08/ 2	54 0	54 0	48 0	52 0	3 5

SUMMARY STATISTICS

	SITES			LAKE
MEAN	49 0	41 0	33 7	41 2
STD DEV	12 8	12 8	11 6	13 3
MIN	36 0	24 0	22 0	22.0
MAX	66 0	54 0	48 0	66 0
AV DEPTH	40.1	29 1	13 0	

-1 = missing values

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) NORTHERN OAKS/TAZEWELL COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
04/ 18	38 5	27 5	11 5	25 8	13 6
05/ 15	40 0	28 0	15.0	27 7	12.5
05/ 26	40 0	27 0	11.0	26 0	14 5
06/ 14	42.0	28 0	12.5	27 5	14.8
07/ 26	39.0	31 0	15.0	28 3	12.2
08/ 2	41.0	33 0	13.0	29.0	14 4

SUMMARY STATISTICS

	SITES			LAKE
MEAN	40.1	29.1	13 0	27.4
STD DEV	1.3	2.4	1.7	11 6
MIN	38.5	27.0	11 0	11 0
MAX	42.0	33.0	15 0	42 0
AV DEPTH	40.1	29.1	13 0	

-1 = missing values

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) NORTHERN OAKS/TAZEWELL COUNTY, ILLINOIS VOLUNTEER DATA 198[illegible]

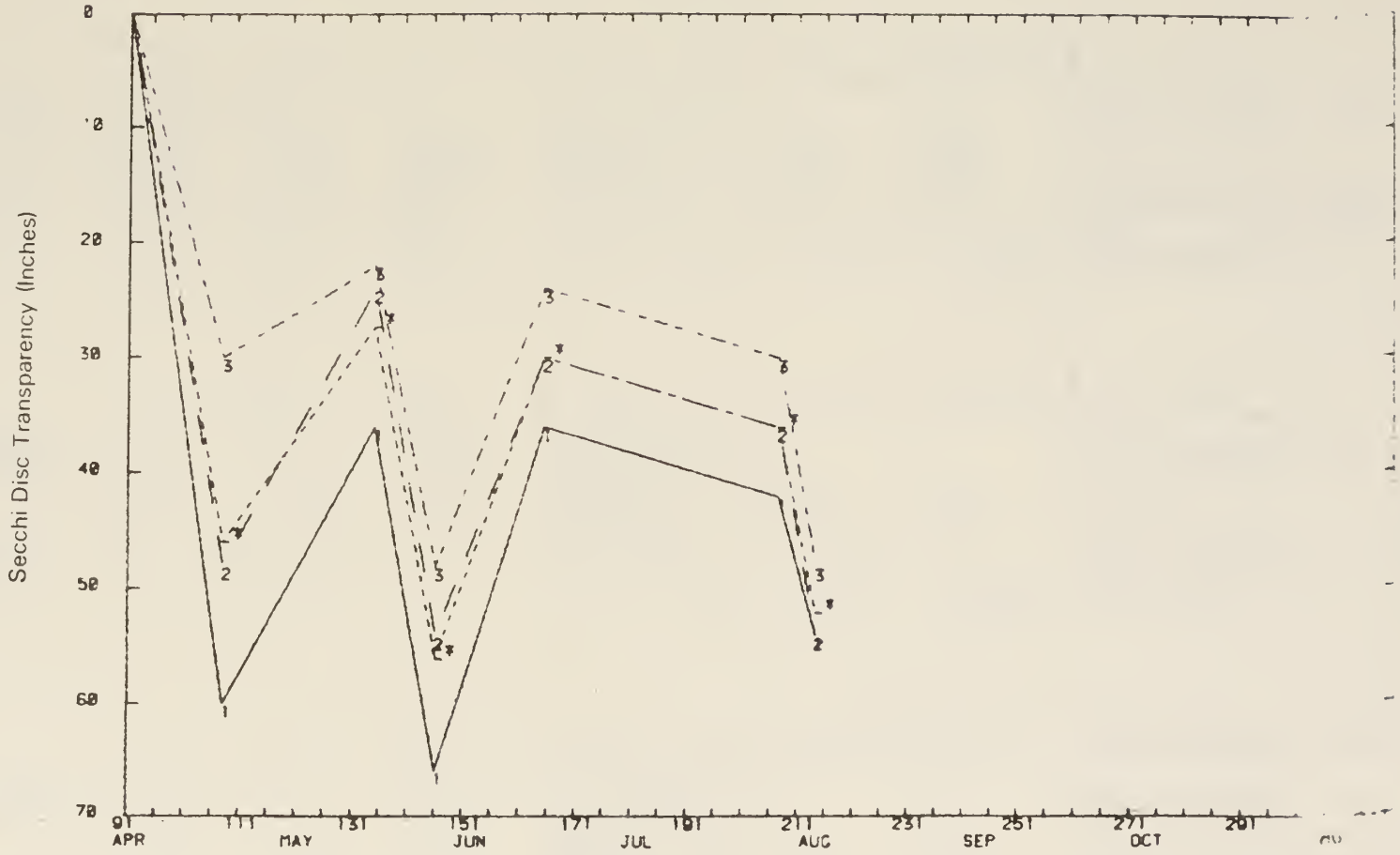

TABLE 4 . FIELD OBSERVATIONS, LAKE NORTHERN OAKS, TAZEWELL COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
4/18/81	WATER COLOR:	lt. green	lt. green	mod. green
	SEDIMENT:	slight	slight	moderate
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	minimal
	OTHER SUBSTANCES:	waterfowl	none	waterfowl
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	clear
PRECIPITATION:	no rain	no rain
WAVES:	calm	calm
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	NE	NE

OBSERVATIONS MADE BY: John Wald, Dawn W

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: fishing, swimming, row boating/canoeing, sailing

LAKE MANAGEMENT: N/A

ADDITIONAL COMMENTS: Lake will be treated with copper sulfate after 7/1/81 for algae control.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
5/15/81	WATER COLOR:	lt. green	brnsh-grn	brnsh-grn
	SEDIMENT:	minimal	large	large
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	moderate	slight	slight
	OTHER SUBSTANCES:	none	none	sediment
	ODOR:	no odor	musty	musty

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	few clouds	clear
PRECIPITATION:	no rain	heavy rain
WAVES:	ripple	ripple
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	E	E

OBSERVATIONS MADE BY: John Wald

OTHER COMMENTS

WATER LEVEL OF LAKE: above normal 6"
RECREATIONAL USAGE: row boating/ canoeing

LAKE MANAGEMENT: 5/15/81 none

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
5/26/81	WATER COLOR:	mod. green	mod. green	grnsh-brn
	SEDIMENT:	moderate	moderate	large
	ALGAE:	minimal	minimal	slight
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	moderate	slight	moderate
	OTHER SUBSTANCES:	waterfowl	none	
	ODOR:	no odor	no odor	

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	overcast	many clouds
PRECIPITATION:	no rain	mod. rain
WAVES:	ripple	ripple
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	SW	NW

OBSERVATIONS MADE BY: John Wald

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: none

LAKE MANAGEMENT: 5/26/81 none

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
6/14/81	WATER COLOR:	mod. green	grnsh-brn	grn-brn
	SEDIMENT:	minimal	slight	large
	ALGAE:	minimal	minimal	moderate
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	moderate	slight	moderate
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	musty	musty

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	overcast	overcast
PRECIPITATION:	lt. rain	heavy rain
WAVES:	ripple	small
AIR TEMPERATURE:	warm	hot
WIND DIRECTION:	NW	NW

OBSERVATIONS MADE BY: John Wald

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: fishing, swimming, row boating/canoeing

LAKE MANAGEMENT: none

ADDITIONAL COMMENTS: Lake will be treated 6/17/81 & 6/24/81 with copper sulfate for algae.

TABLE 4 . FIELD OBSERVATIONS, LAKE NORTHERN OAKS, TAZEWELL COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/26/81	WATER COLOR:	brnsh-grn	grn-brn	brnsh-grn	CLOUD COVER:	few clouds	few clouds	WATER LEVEL OF LAKE:
	SEDIMENT:	moderate	moderate	large	PRECIPITATION:	no rain	lt. rain	RECREATIONAL USAGE: none
	ALGAE:	moderate	large	large	WAVES:	ripple	ripple	(Lake closed for treatment)
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	warm	
	WEEDS NEAR SHORE:	moderate	slight	moderate	WIND DIRECTION:	normal	normal	LAKE MANAGEMENT: 7/26/81 500# copper sulfate for algae control
	OTHER SUBSTANCES:	algal mats	"clippings"	algal mats				ADDITIONAL COMMENTS: Second treatment of year for algae.
	ODOR:	no odor	musty	musty	OBSERVATIONS MADE BY: John Wald			

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/2/81	WATER COLOR:	brnsh-grn	very green	lt. green	CLOUD COVER:	hazy	clear	WATER LEVEL OF LAKE: normal
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: fishing, swimming,
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	ripple	row boating/canoeing
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	warm	
	WEEDS NEAR SHORE:	moderate	slight	moderate	WIND DIRECTION:	SW	SW	LAKE MANAGEMENT: 7/26/81 500# copper sulfate for algae
	OTHER SUBSTANCES:	none	none	none				ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor	OBSERVATIONS MADE BY: John Wald			

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR:				CLOUD COVER:			WATER LEVEL OF LAKE:
	SEDIMENT:				PRECIPITATION:			RECREATIONAL USAGE:
	ALGAE:				WAVES:			
	WEEDS AT SAMPLE SITE:				AIR TEMPERATURE:			
	WEEDS NEAR SHORE:				WIND DIRECTION:			LAKE MANAGEMENT:
	OTHER SUBSTANCES:							
	ODOR:				OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR:				CLOUD COVER:			WATER LEVEL OF LAKE:
	SEDIMENT:				PRECIPITATION:			RECREATIONAL USAGE:
	ALGAE:				WAVES:			
	WEEDS AT SAMPLE SITE:				AIR TEMPERATURE:			
	WEEDS NEAR SHORE:				WIND DIRECTION:			LAKE MANAGEMENT:
	OTHER SUBSTANCES:							
	ODOR:				OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:

Because Secchi measurements were not taken in September and October, seasonal differences in the transparency of Northern Oaks Lake cannot be completely defined. The lowest transparencies were found on May 15 and June 14 and were probably the result of increased amounts of suspended sediment caused by heavy rain which fell during the preceeding twenty-four hours.

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Northern Oaks Lake (estimated at twice the Secchi depth) ranged from 6.0-11.0 feet at Site 1, from 4.0-9.0 feet at Site 2, from 3.7-8.0 feet at Site 3. Since Northern Oaks Lake is deep enough to thermally stratify at Sites 1 and 2, and had a euphotic zone that was generally less than the total depth, low dissolved oxygen values would be expected in the bottom waters.

In the absence of dissolved oxygen, substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. These substances can contribute to serious taste and odor problems in drinking water if water supply is taken from near the lake bottom during summer stratification. When the substances which have accumulated in the bottom waters during stratification periods are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, taste and odor, and other water quality problems.

SUMMARY AND RECOMMENDATIONS

Summary

Northern Oaks Lake, a small public water supply and recreational impoundment in central Illinois, was sampled on six dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer John Wald recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Northern Oaks Lake (41.2 inches) ranked 40th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). Although this average transparency was less than the four feet minimum recommended for swimming by the Department of Public Health, it was in the normal range for Illinois lakes and was compatible with most recreational uses.

Sites 1 and 2 on Northern Oaks Lake are deep enough to thermally stratify during the summer. Since the lower limit of their euphotic zone (estimated at twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Northern Oaks Lake is undergoing the process of eutrophication, as evidenced by low transparency readings and field observations of algae, weed, and sediment problems. The lake is probably near the critical point where controlling inputs of nutrients and sediment will most likely improve lake quality, while failure to control them will probably result in continued rapid eutrophication. It is thus in need of protection from further degradation. It is very important for lake managers to look critically for sources of nutrients and sediment which may be entering the lake and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for this lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input.

In-lake management may also warrant consideration. Drawing oxygenated water from the upper strata for water supply use may help alleviate taste and odor problems. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem-causing blue-greens, reduce the need for copper sulfate, help to alleviate taste and odor problems, and improve fishing. Harvesting of aquatic weeds might also be considered.

Continued monitoring is recommended for Northern Oaks Lake. Consistent data gathered over a period of years is necessary to more fully document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

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GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratifcation - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic setteable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen dificiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and exhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution eminating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy priviledges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

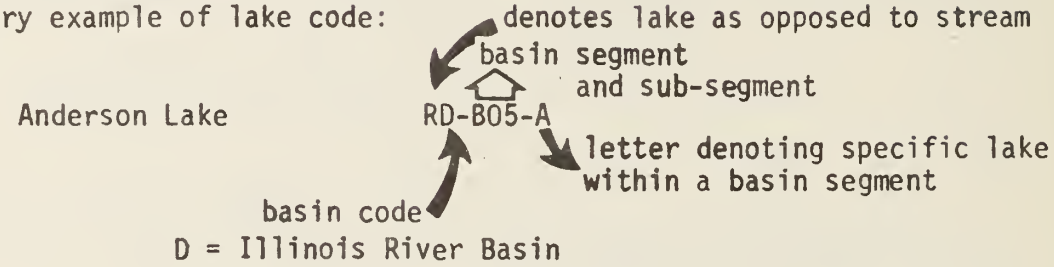
water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

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MONITORING PROGRAM REPORT

LAKE MINEARL LAKE Co.

1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

FOR

LAKE MINEAR, LAKE COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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ACKNOWLEDGEMENTS

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Program coordination was provided by Donna Sefton for the Illinois EPA's Ambient Monitoring Unit and Carol Beim for the Public Participation Section.

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Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

Donna Sefton, Howard Essig, John Little, John Lesnak, Carol Beim, and Bob Hagele wrote portions of the lake reports. Reports were edited by Planning Section and Public Participation staff, particularly Marilyn Budd and Mary Anderson. The contributions of Robert Clarke and Thomas Davenport are recognized.

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Lake Minear is a 64 acre impoundment owned by Lake Minear Conservation Association. It is located in Libertyville, Lake County, Illinois. The lake was constructed in 1930 by filling a sand and gravel quarry, and has a maximum depth of 25 feet, an average depth of 15 feet and a storage capacity of 960 feet (Table 1).

Lake Minear serves as a recreational lake. Fishing, swimming, power boating, rowboating or canoeing and sailboating, picnicking, and waterfowl observation are moderate uses of the lake. Access is limited to members of the Libertyville Boat Club. Membership is allowed for up to 1250 Libertyville families. Dues are $30.00 per year.

Lake Minear's 345 acre watershed is estimated to be 85 percent residential. The lake shoreline is also primarily residential.

Aquatic weeds are considered to be a moderate problem in Lake Minear. Urban storm drainage, construction site runoff, sediment in the lake and the Des Plaines River are considered potential pollution sources. Two municipal storm sewers drain into the lake. The Des Plaines River floods into the lake approximately once every 100 years.

TABLE 1. LAKE ASSESSMENT SUMMARY, LAKE MINEAR, LAKE COUNTY, ILLINOIS (RG-B01-P).

I. GENERAL INFORMATION

River Basin: DesPlaines
Segment: B01

Ownership: Lake Minear Conservation Assoc.

Surface Area (Acres): 64
Watershed Area (Acres): 345
Maximum Depth (Feet): 25
Average Depth (Feet): 15
Storage Capacity (Acre/Feet): 960
Inflowing Stream(s): DesPlaines River
Outflowing Stream(s): none
Water Retention Time:
Lake Type: sand or gravel quarry
Year Constructed: 1930

II. USAGE

Public Access: no Libertyville Boat Club only
Lake Usage:
Potable Water Supply: none
Industrial Water Supply: none
Agricultural Water Supply: none
Cooling Water: none
Recreation:
Fishing: moderate
Swimming: moderate
Power Boating: moderate
Row Boating or Canoeing: moderate
Sailboating: moderate
Camping: none
Picnicking: moderate
Waterfowl Hunting: none
Waterfowl Observation: moderate
Other: waterskiing-moderate

Recreational Facilities:
beach, picnic area, boat launch

Shoreline Usage (Percent):
Urban (Including Streets):
Residential (Including Lawns): 50%
Golf Courses:
Pasture or Grassland:
Woodland: 35%
Row Crops:
Wetland: 15%
Other:

Watershed Usage (Percent):
Urban:
Residential: 85%
Golf Courses:
Pasture or Grassland:
Woodland: 10%
Row Crops:
Wetland: 5%
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: fair
Fishing: fair
Conditions and Extent:
Suspended Sediment: slight
Deposition of Sediment: slight
Algal Blooms: slight
Aquatic Weeds: moderate
Taste and/or Odor: slight
Water Level Fluctuation: slight
Fishkills: minimal
Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:
Sewage Treatment Plant Effluent:
Industrial Discharge:
Urban Storm Drainage: yes*
Septic Tanks:
Pasture or Grassland Runoff:
Cropland Runoff:
Feedlot Runoff:
Construction Site Runoff: yes
Fertilizer or Pesticides from Lawns/Golf Courses:
Orchards:
Forestry Operations Runoff:
Mining:
Waterfowl:
Sediment in Lake: yes
Other: Des Plaines River floods into lake about once every 100 years. * 2 municipal sewers drain into it

V. LAKE MANAGEMENT

Comments:

Information Supplied By Ted Bond (1981)

Assessment and monitoring information for Lake Minear was provided by Ted Bond. Secchi disc depth, total depth, and field observations were recorded at three sites (located in Figure 1) on seven dates in 1981.

RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Lake Minear are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

Transparency of Lake Minear

The average Secchi disc transparency of Lake Minear was 61.9 inches, which ranked number 16 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was greater than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was above average for Illinois lakes.

Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Lake Minear ranged from a minimum of 30.0 inches at Site 3 on June 28 to a maximum of 84.0 inches at Site 2 on May 30.

The clarity of Lake Minear was relatively uniform at the three sites. Transparency averaged 61.7 inches, 64.3 inches, and 59.6 inches at Sites 1, 2, and 3, respectively. Readings at Site 1 were greater than the four feet minimum recommended for swimming on all sampling dates, while at Sites 2 and 3 they were less than four feet on June 28.

Since Secchi measurements were not taken in September and October, seasonal differences in the transparency of Lake Minear could not be completely described. Lowest transparencies were recorded on June 28 and were probably the result of algae blooms.

Field observations indicate that the transparency of Lake Minear was influenced primarily by the presence of algae. A green water color was observed from June through August. Moderate to large amounts of aquatic weeds were noted at Site 3 throughout most of the sampling period. This may reflect the shallow nature of the site (average depth 7.8 feet) and/or the occurrence of nutrient input in the vicinity.

FIGURE 1

MINEAR LAKE

LAKE COUNTY

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) MINEAR/LAKE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 12	60.0	60.0	54.0	58.0	3.5
05/ 30	72.0	84.0	72.0	76.0	6.9
06/ 14	66.0	72.0	60.0	66.0	6.0
06/ 28	54.0	42.0	30.0	42.0	12.0
07/ 19	60.0	66.0	60.0	65.0	4.6
07/ 30	54.0	60.0	60.0	58.0	3.5
08/ 23	66.0	66.0	72.0	68.0	3.5

SUMMARY STATISTICS

	SITES			LAKE
MEAN	61.7	64.3	59.6	61.9
STD DEV	6.7	12.8	14.7	11.5
MIN	54.0	42.0	30.0	30.0
MAX	72.0	84.0	72.0	84.0
AV DEPTH	19.6	13.5	7.8	

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) MINEAR/LAKE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 12	19.5	11.5	7.0	12.7	6.3
05/ 30	17.0	14.0	8.0	13.0	4.6
06/ 14	28.5	15.0	9.5	15.0	8.5
06/ 28	28.0	19.5	3.0	11.2	8.5
07/ 19	18.5	16.0	10.5	15.0	4.1
07/ 30	20.5	12.5	7.5	13.5	6.6
08/ 23	21.0	15.0	9.0	15.0	6.0

SUMMARY STATISTICS

	SITES			LAKE
MEAN	19.6	13.5	7.8	13.6
STD DEV	1.4	2.0	2.4	5.3
MIN	17.0	10.5	3.0	3.0
MAX	21.0	16.0	10.5	21.0
AV DEPTH	19.6	13.5	7.8	

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) MINEAR/LAKE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

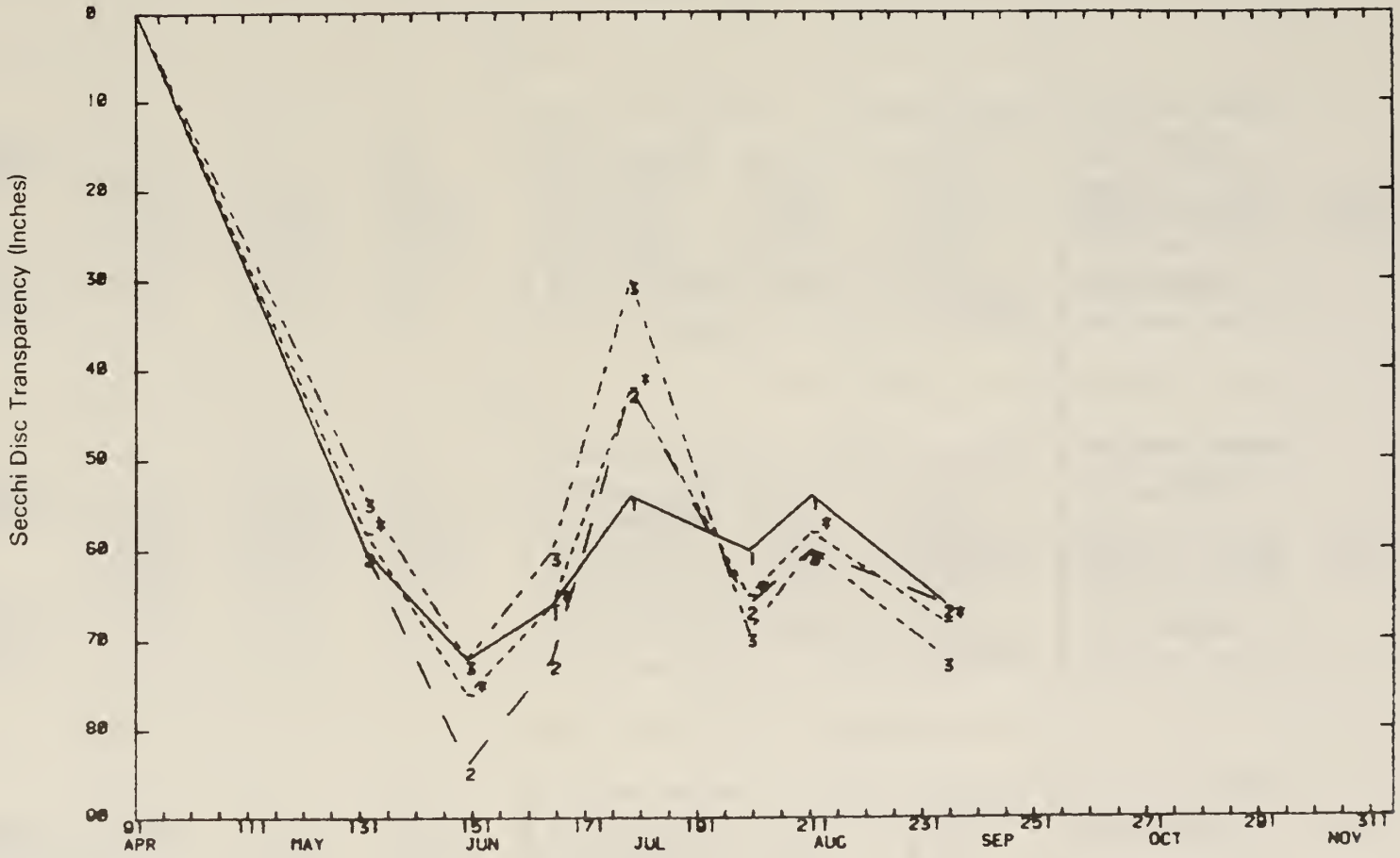

TABLE 4. FIELD OBSERVATIONS, LAKE MINEAR, LAKE COUNTY, ILLINOIS

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
5/12/81	WATER COLOR:	clear	clear	clear
	SEDIMENT:	minimal	minimal	slight
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	slight	minimal
	WEEDS NEAR SHORE:	minimal	minimal	minimal
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	overcast	many clouds
PRECIPITATION:	no rain	no rain
WAVES:	ripple	ripple
AIR TEMPERATURE:	cool	cool
WIND DIRECTION:	SE	SE

OBSERVATIONS MADE BY: Ted Bond

OTHER COMMENTS

WATER LEVEL OF LAKE: below normal 12"
RECREATIONAL USAGE: none

LAKE MANAGEMENT: none

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
5/30/81	WATER COLOR:	clear	clear	clear
	SEDIMENT:	minimal	minimal	minimal
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	moderate
	WEEDS NEAR SHORE:	moderate	minimal	moderate
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	many clouds	overcast
PRECIPITATION:	no rain	mod. rain
WAVES:	small	white caps
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	N	S

OBSERVATIONS MADE BY: Ted Bond

OTHER COMMENTS

WATER LEVEL OF LAKE: below normal 12"
RECREATIONAL USAGE: none

LAKE MANAGEMENT: none

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
6/14/81	WATER COLOR:	lt. green	lt. green	lt. green
	SEDIMENT:	minimal	minimal	slight
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	large
	WEEDS NEAR SHORE:	slight		large
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	many clouds	overcast
PRECIPITATION:	no rain	lt. rain
WAVES:	ripple	ripple
AIR TEMPERATURE:	hot	hot
WIND DIRECTION:	SE	SE

OBSERVATIONS MADE BY: Ted Bond

OTHER COMMENTS

WATER LEVEL OF LAKE: below normal 12"
RECREATIONAL USAGE: swimming, power boating, waterskiing, sailing, picnicking

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
6/28/81	WATER COLOR;	mod. green	mod. green	brnsh-grn
	SEDIMENT:	minimal	minimal	slight
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	moderate
	WEEDS NEAR SHORE:	moderate	minimal	moderate
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	few clouds	few clouds
PRECIPITATION:	no rain	no rain
WAVES:	moderate	small
AIR TEMPERATURE:	very hot	hot
WIND DIRECTION:	S	S

OBSERVATIONS MADE BY: Ted Bond

OTHER COMMENTS

WATER LEVEL OF LAKE: below normal 12"
RECREATIONAL USAGE: swimming, sailing, picnicking

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

TABLE 4.. FIELD OBSERVATIONS, LAKE MINEAR, LAKE COUNTY, ILLINOIS

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
7/19/81	WATER COLOR:	lt. green	lt. green	lt. green
	SEDIMENT:	minimal	minimal	minimal
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	large
	WEEDS NEAR SHORE:	large	moderate	large
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	overcast	few clouds
PRECIPITATION:	no rain	no rain
WAVES:	small	small
AIR TEMPERATURE:	hot	hot
WIND DIRECTION:	SE	SE
OBSERVATIONS MADE BY:	Ted Bond	

OTHER COMMENTS

WATER LEVEL OF LAKE: below normal 18"
RECREATIONAL USAGE: swimming, sailing, picnicking

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
7/30/81	WATER COLOR:	mod. green	mod. green	mod. green
	SEDIMENT:	minimal	minimal	minimal
	ALGAE:	slight	slight	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	large
	WEEDS NEAR SHORE:	large	moderate	large
	OTHER SUBSTANCES:	none	none	none
	ODOR:	rotten egg	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	clear
PRECIPITATION:	no rain	no rain
WAVES:	ripple	ripple
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	SE	SE
OBSERVATIONS MADE BY:	Ted Bond	

OTHER COMMENTS

WATER LEVEL OF LAKE: below normal 18"
RECREATIONAL USAGE: none

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
8/23/81	WATER COLOR:	mod. green	mod. green	mod. green
	SEDIMENT:	minimal	minimal	minimal
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	large
	WEEDS NEAR SHORE:	large	large	large
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	many clouds	many clouds
PRECIPITATION:	no rain	vry.lt.rain
WAVES:	ripple	ripple
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	SE	SE
OBSERVATIONS MADE BY:	Ted Bond	

OTHER COMMENTS

WATER LEVEL OF LAKE: below normal 18"
RECREATIONAL USAGE: fishing, swimming& sailing

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
	WATER COLOR;			
	SEDIMENT:			
	ALGAE:			
	WEEDS AT SAMPLE SITE:			
	WEEDS NEAR SHORE:			
	OTHER SUBSTANCES:			
	ODOR:			

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:		
PRECIPITATION:		
WAVES:		
AIR TEMPERATURE:		
WIND DIRECTION:		
OBSERVATIONS MADE BY:		

OTHER COMMENTS

WATER LEVEL OF LAKE:
RECREATIONAL USAGE:

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Lake Minear (estimated at twice the Secchi depth) ranged from 9.0-12.0 feet at Site 1, from 7.0-14.0 feet at Site 2, from 5.0-12.0 feet at Site 3. Since Sites 1 and 2 are deep enough to thermally stratify and had euphotic zones that were generally less than the total depths, low dissolved oxygen values would be expected in the bottom waters of these sites. The euphotic zone at Site 3 (average depth of 7.8 feet) extended to the bottom at the time of measurement.

In the absence of dissolved oxygen, undesirable substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. When these substances are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, taste and odor, and other water quality problems.

SUMMARY AND RECOMMENDATIONS

Summary

Lake Minear, a flooded gravel pit which is used for recreation in northeastern Illinois, was sampled on seven dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer Ted Bond recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Lake Minear (61.9 inches) ranked 16th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was greater than the four feet minimum recommended for swimming by the Department of Public Health and was above average for Illinois lakes.

Sites 1 and 2 on Lake Minear are deep enough to thermally stratify during the summer. Since the lower limit of their euphotic zones (estimated at twice the Secchi depth) are generally less than the total depths, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Lake Minear is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Information on lake water levels is important for determining lake management strategies. Installation of a simple, but accurate, water level measuring device and frequent recording of lake water levels is recommended.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient and sediment contributions from urban storm drainage, construction site runoff, and fertilization of lawns should also be investigated and minimized.

In-lake management may also warrant consideration. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem-causing blue-greens, and improve fishing. Harvesting of aquatic weeds or use of screens might also be considered.

Continued monitoring is recommended for Lake Minear. Consistent data gathered over a period of years is necessary to more fully document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

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DS:jab/sp3871C

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratifcation - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic setteable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen dificiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and exhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution eminating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy priviledges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

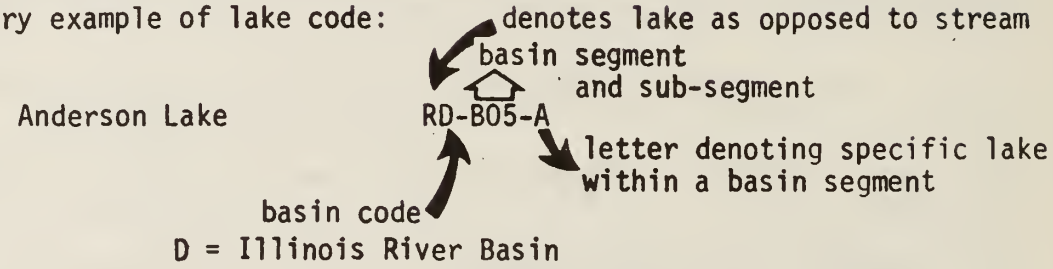
water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

LAKE MATTOON / COLES CO.

1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

FOR

LAKE MATTOON, COLES COUNTY, ILLINOIS

A Cooperative Citizen-
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Lake Mattoon is a 1,028 acre impoundment owned by the City of Mattoon, Coles, Cumberland and Shelby Counties, Illinois. It was constructed by the damming of the Little Wabash, Flat Branch and Salt Creeks in 1958. The lake has a maximum depth of 35 feet, an average depth of 11.3 feet, and a storage capacity of 11,660 acre feet (Table 1).

Lake Mattoon serves as an alternate water supply for the City. Recreational uses associated with the lake include fishing, swimming, power boating, rowboating, canoeing, sailboating, camping, picnicking, waterfowl hunting and waterfowl observation. Access is unlimited, although a fee is charged.

The 35,480 acre watershed of Lake Mattoon is estimated to be 75% row crops. The lake shoreline is primarily wooded and residential.

Deposition of sediment is considered a moderate problem for Lake Mattoon. Septic tanks, pasture or grassland runoff, cropland runoff, waterfowl and sediment in the lake are cited as potential pollution sources.

TABLE 1. LAKE ASSESSMENT SUMMARY, MATTOON LAKE, COLES, CUMBERLAND, SHELBY COUNTIES, ILLINOIS (RC-A09-F).

I. GENERAL INFORMATION

River Basin: Little Wabash
Segment: A09

Ownership: City of Mattoon

Surface Area (Acres): 1028*
Watershed Area (Acres): 35,480*
Maximum Depth (Feet): 35*
Average Depth (Feet): 11.3*
Storage Capacity (Acre/Feet): 11,660*
Inflowing Stream(s): Flat Branch Salt Creek
Outflowing Stream(s): Little Wabash
Water Retention Time: 0.39 year
Lake Type: dammed stream
Year Constructed: 1959

II. USAGE

Public Access: yes
Lake Usage:
- Potable Water Supply: light
- Industrial Water Supply: none
- Agricultural Water Supply: none
- Cooling Water: none
- Recreation:
  - Fishing: moderate
  - Swimming: light
  - Power Boating: heavy
  - Row Boating or Canoeing: moderate
  - Sailboating: heavy
  - Camping: moderate
  - Picnicking: light
  - Waterfowl Hunting: light
  - Waterfowl Observation: moderate
  - Other:

Recreational Facilities:
Campgrounds, boat launch, bait shops

Shoreline Usage (Percent):
- Urban (Including Streets):
- Residential (Including Lawns): 40%
- Golf Courses:
- Pasture or Grassland: 4%
- Woodland: 55%
- Row Crops:
- Wetland: 1%
- Other:

Watershed Usage (Percent):
- Urban: 3%
- Residential:
- Golf Courses:
- Pasture or Grassland: 12%
- Woodland: 10%
- Row Crops: 75%
- Wetland:
- Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: good
Fishing: fair
Conditions and Extent:
- Suspended Sediment: moderate
- Deposition of Sediment: slight
- Algal Blooms: slight
- Aquatic Weeds: slight
- Taste and/or Odor: slight
- Water Level Fluctuation: slight
- Fishkills: minimal
- Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:
- Sewage Treatment Plant Effluent:
- Industrial Discharge:
- Urban Storm Drainage:
- Septic Tanks: yes
- Pasture or Grassland Runoff: yes
- Cropland Runoff:
- Feedlot Runoff:
- Construction Site Runoff:
- Fertilizer or Pesticides from Lawns/Golf Courses:
- Orchards:
- Forestry Operations Runoff:
- Mining:
- Waterfowl: yes
- Sediment in Lake: yes
- Other:

V. LAKE MANAGEMENT

Comments:

Information Supplied By David Bergman (1981): *Illinois State Water Survey, Sediment Survey (1981).

Assessment information was provided by Dave Bergman, the Water Treatment Plant Operator, and the Illinois State Water Survey. Monitoring was performed by David Bergman. Secchi disc transparency, total depth, and field observations were recorded at three sites (located in Fig. 1) on five dates in 1981.

RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Lake Mattoon are summarized in Table 2 and plotted in Fig. 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

Transparency of Lake Mattoon

The average Secchi disc transparency of Lake Mattoon was 20.7 inches, which ranked number 63 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was in the range generally associated with use impairment problems in Illinois lakes. However, above average rainfall during the sampling season may have resulted in below normal transparency.

Spatial and Seasonal Differences in Transparency

The Secchi transparency of Lake Mattoon ranged from a minimum of 8 inches at Site 3 on June 18 to a maximum of 30 inches at Site 2 on July 10.

The clarity was relatively uniform at Sites 1 and 2, while it was considerably less at Site 3. The average transparencies of Sites 1, 2 and 3 were 24.8 inches, 26.4 inches and 10.8 inches, respectively. The Secchi readings at the three sites were below the four feet minimum recommended for swimming on all sampling dates. The lower transparencies at Site 3 were probably related, in part, to the shallow depth of the site (average depth 4.8 feet) which allows the resuspension of bottom sediment by wind and wave activity. It may also reflect the input of nutrients and sediments in the vicinity.

FIGURE 1

LAKE MATTOON

COLES, CUMBERLAND & SHELBY COUNTIES

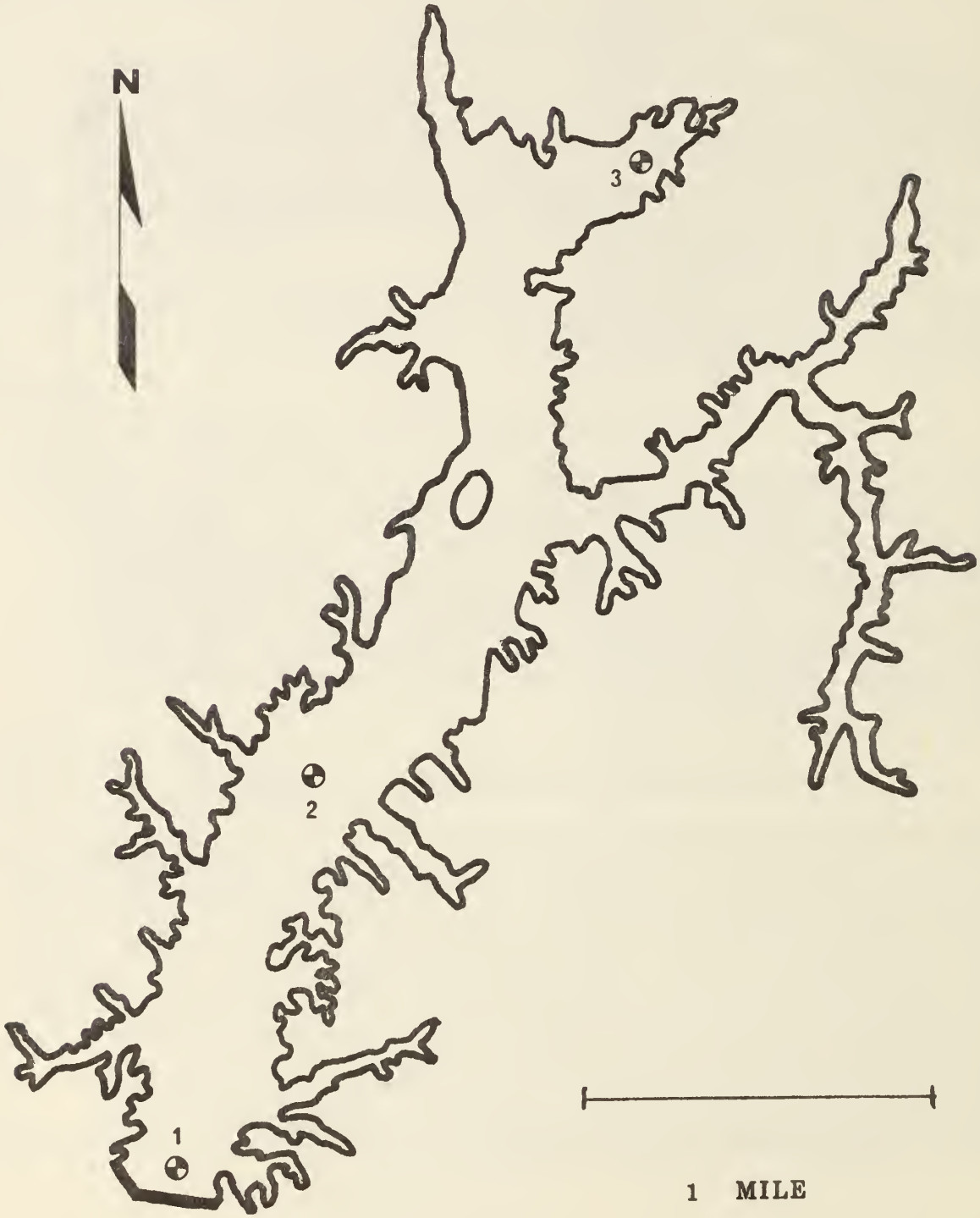


TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) MATTOON/COLES COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 27	26.0	26.0	12.0	21.3	8.1
06/ 10	20.0	26.0	8.0	18.0	9.2
07/ 10	20.0	30.0	12.0	23.3	9.0
09/ 4	26.0	26.0	10.0	20.7	9.2
10/ 2	24.0	24.0	12.0	20.0	6.9

SUMMARY STATISTICS

	SITES			LAKE
MEAN	24.0	26.4	10.0	20.7
STD DEV	3.0	2.2	1.6	7.6
MIN	20.0	24.0	8.0	8.0
MAX	28.0	30.0	12.0	30.0
AV DEPTH	20.0	20.4	4.0	

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) MATTOON/COLES COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 27	25.0	20.0	5.0	16.7	10.4
06/ 10	30.0	20.0	4.0	18.0	13.1
07/ 10	20.0	20.0	5.0	18.0	12.1
09/ 4	30.0	22.0	5.0	19.0	12.0
10/ 2	30.0	20.0	5.0	18.3	12.6

SUMMARY STATISTICS

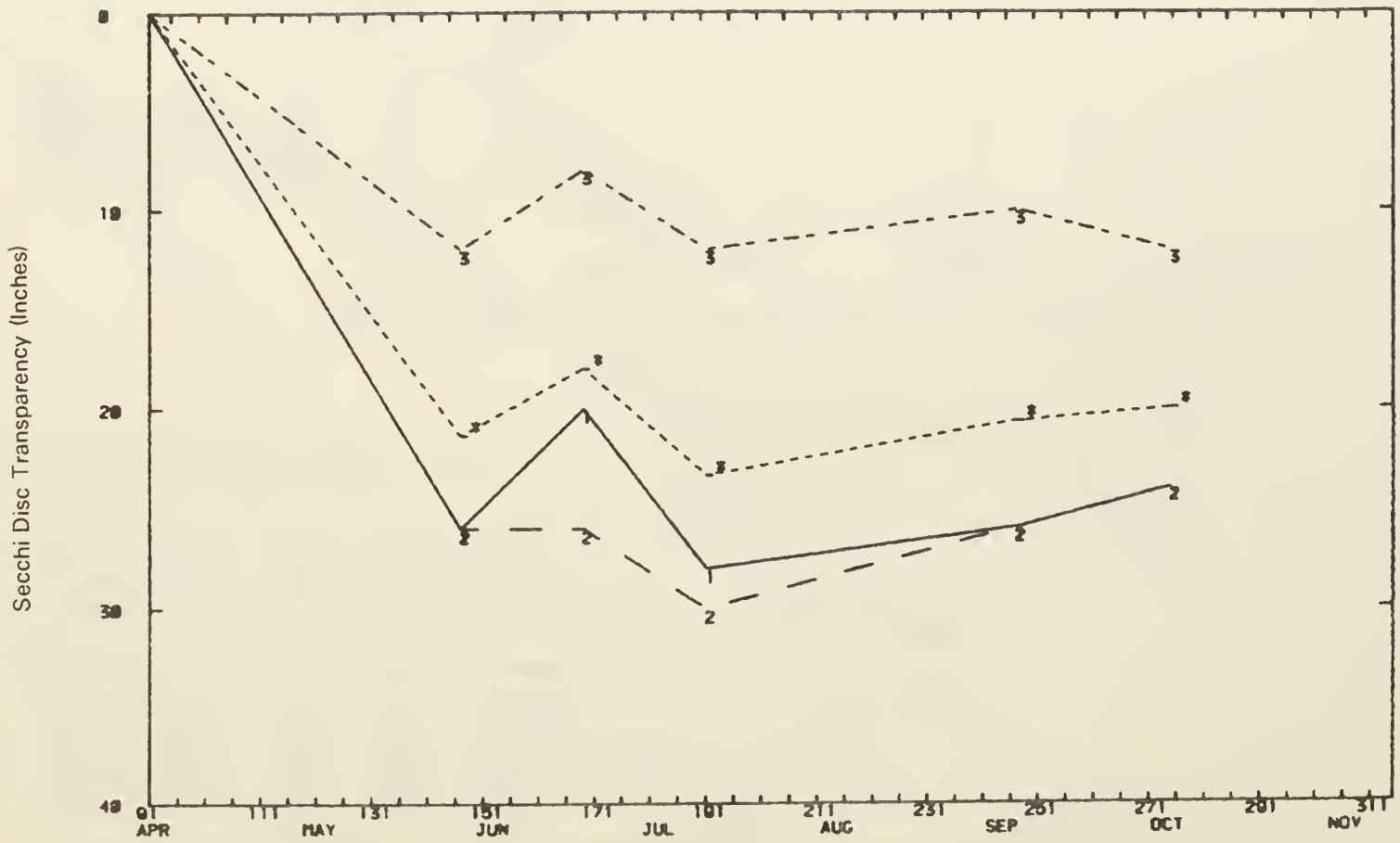
	SITES			LAKE
MEAN	20.0	20.4	4.0	18.0
STD DEV	2.2	0.9	0.4	10.4
MIN	20.0	20.0	4.0	4.0
MAX	30.0	22.0	5.0	30.0
AV DEPTH	20.0	20.4	4.0	

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) MATTOON/COLES COUNTY, ILLINOIS (VOLUNTEER DATA 1981)



Day of Year

KEY

1 Site 1
2 Site 2
3 Site 3
* Mean (Average)

TABLE 4. FIELD OBSERVATIONS, MATTOON LAKE, COLES, CUMBERLAND, SHELBY COUNTIES, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
5/27/81	WATER COLOR;	mod. green	mod. green	brnsh-grn	CLOUD COVER:	many clouds	overcast	WATER LEVEL OF LAKE: normal
	SEDIMENT:	minimal	minimal	slight	PRECIPITATION:	no rain	v. lt. rain	RECREATIONAL USAGE: fishing, camping, picnicking
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	calm	
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	cool	cool	LAKE MANAGEMENT:
	WEEDS NEAR SHORE:	minimal	minimal	slight	WIND DIRECTION:	N	SE	
	OTHER SUBSTANCES:	dead fish	none	detritus	OBSERVATIONS MADE BY: David Bergman			ADDITIONAL COMMENTS:
	ODOR:	no odor	fishy	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
6/18/81	WATER COLOR:	mod. green	grnsh-brn	brnsh-grn	CLOUD COVER:	clear	clear	WATER LEVEL OF LAKE: normal
	SEDIMENT:	minimal	minimal	slight	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: fishing, swimming power boating, waterskiing
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	ripple	
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	warm	LAKE MANAGEMENT:
	WEEDS NEAR SHORE:	minimal	minimal	moderate	WIND DIRECTION:	SW	SW	
	OTHER SUBSTANCES:	none	none		OBSERVATIONS MADE BY: David Bergman			ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/10/81	WATER COLOR:	mod green	mod green	grnsh-brn	CLOUD COVER:	clear	many clouds	WATER LEVEL OF LAKE: above normal
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	v. lt. rain	RECREATIONAL USAGE: power boating, waterskiing
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	ripple	
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	very hot	very hot	LAKE MANAGEMENT:
	WEEDS NEAR SHORE:	minimal	minimal	large	WIND DIRECTION:	N	N	
	OTHER SUBSTANCES:	none	detritus	none	OBSERVATIONS MADE BY: David Bergman			ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
9/4/81	WATER COLOR:	mod. green	mod. green	brnsh-grn	CLOUD COVER:	many clouds	overcast	WATER LEVEL OF LAKE: normal
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	v. lt. rain	RECREATIONAL USAGE: fishing, power boating
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	ripple	
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	warm	LAKE MANAGEMENT:
	WEEDS NEAR SHORE:	minimal	slight	moderate	WIND DIRECTION:	W	W	
	OTHER SUBSTANCES:	none	none	waterfowl	OBSERVATIONS MADE BY: David Bergman			ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

TABLE 4. FIELD OBSERVATIONS, MATTOON LAKE, COLES, CUMBERLAND, SHELBY COUNTIES, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
10/2/81	WATER COLOR:	mod. green	mod. green	brnsh-grn
	SEDIMENT:	minimal	minimal	minimal
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	slight	slight	moderate
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	many clouds
PRECIPITATION:	no rain	no rain
WAVES:	ripple	moderate
AIR TEMPERATURE:	cool	cool
WIND DIRECTION:	NW	SW
OBSERVATIONS MADE BY:	David Bergman	

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: fishing, power boating

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
	WATER COLOR:			
	SEDIMENT:			
	ALGAE:			
	WEEDS AT SAMPLE SITE:			
	WEEDS NEAR SHORE:			
	OTHER SUBSTANCES:			
	ODOR:			

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:		
PRECIPITATION:		
WAVES:		
AIR TEMPERATURE:		
WIND DIRECTION:		
OBSERVATIONS MADE BY:		

OTHER COMMENTS

WATER LEVEL OF LAKE:
RECREATIONAL USAGE:

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
	WATER COLOR:			
	SEDIMENT:			
	ALGAE:			
	WEEDS AT SAMPLE SITE:			
	WEEDS NEAR SHORE:			
	OTHER SUBSTANCES:			
	ODOR:			

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:		
PRECIPITATION:		
WAVES:		
AIR TEMPERATURE:		
WIND DIRECTION:		
OBSERVATIONS MADE BY:		

OTHER COMMENTS

WATER LEVEL OF LAKE:
RECREATIONAL USAGE:

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
	WATER COLOR:			
	SEDIMENT:			
	ALGAE:			
	WEEDS AT SAMPLE SITE:			
	WEEDS NEAR SHORE:			
	OTHER SUBSTANCES:			
	ODOR:			

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:		
PRECIPITATION:		
WAVES:		
AIR TEMPERATURE:		
WIND DIRECTION:		
OBSERVATIONS MADE BY:		

OTHER COMMENTS

WATER LEVEL OF LAKE:
RECREATIONAL USAGE:

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

The lake was extremely turbid throughout the June-October sampling. Field observations indicate that the lack of transparency was due to both sediment and algae at Site 3 and primarily algae at Sites 1 and 2. A brownish-green water color was noted at Site 3, while a moderate green color was observed at Sites 1 and 2. This change in water color indicates that the sediment load tends to settle out in the upper end of the lake (Site 3) and algae become more of a problem towards the dam (Sites 2 and 1).

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Lake Mattoon (estimated at twice the Secchi depth) ranged from 3.3 - 4.7 feet at Site 1, 4.0 - 5.0 feet at Site 2, and 1.3 - 2.0 feet at Site 3. Since Sites 1 and 2 were deep enough to thermally stratify and had a euphotic zone that was generally less than the total depth, low dissolved oxygen values would be expected in the bottom waters of these sites during summer stratification.

In the absence of dissolved oxygen, substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. These substances can contribute to serious taste and oder problems in drinking water if water supply is taken from near the lake bottom during summer stratification. When these substances are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, and other water quality problems.

SUMMARY AND RECOMMENDATIONS

Summary

Lake Mattoon, a large public water supply and recreational lake in east-central Illinois, was sampled on five dates between April 15 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer David Bergman recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Lake Mattoon (20.7 inches) ranked 63rd of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was less than the four feet minimum recommended for swimming by the Department of Public Health, and was in the range generally associated with use impairment problems for Illinois lakes.

Field observations indicated that the transparency of Lake Mattoon was influenced by sediment and algae in the headwaters (Site 3), and primarily algae nearer the dam (Site 1 and 2).

Lake Mattoon is deep enough to thermally stratify during the summer. Since the lower limit of its euphotic zone (estimated at twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Lake Mattoon is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Pollutant contributions from septic tanks, fertilization of lawns, and waterfowl should also be investigated and minimized.

In-lake management may also warrant consideration. Drawing oxygenated water from the upper strata for water supply use may help alleviate taste and odor problems. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem causing blue-greens, help to alleviate taste and odor problems, and improve fishing.

Continued monitoring is recommended for Lake Mattoon. Consistent data gathered over a period of years is necessary to more fully document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

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DS:jab/sp2161c

GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratifcation - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic setteable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen dificiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and exhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution eminating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy priviledges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

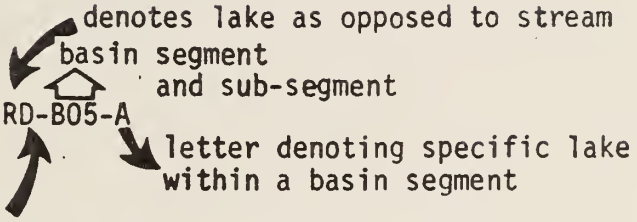
water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



Anderson Lake

*Definitions of items in sense used in text

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